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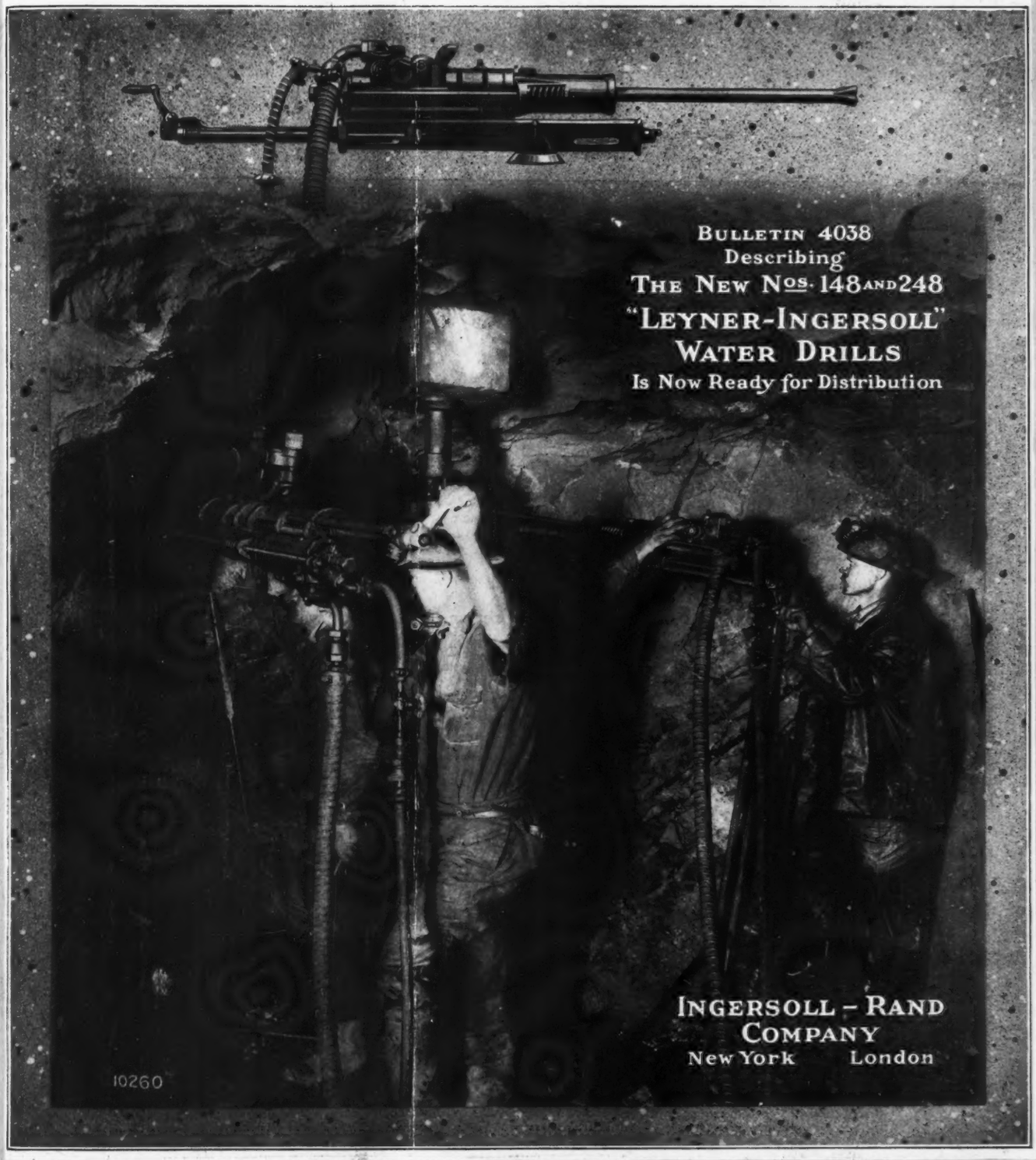

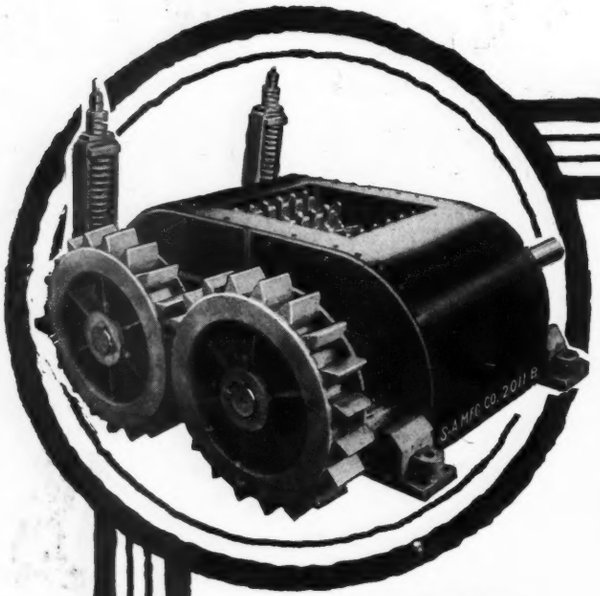

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Engineering and Mining Journal

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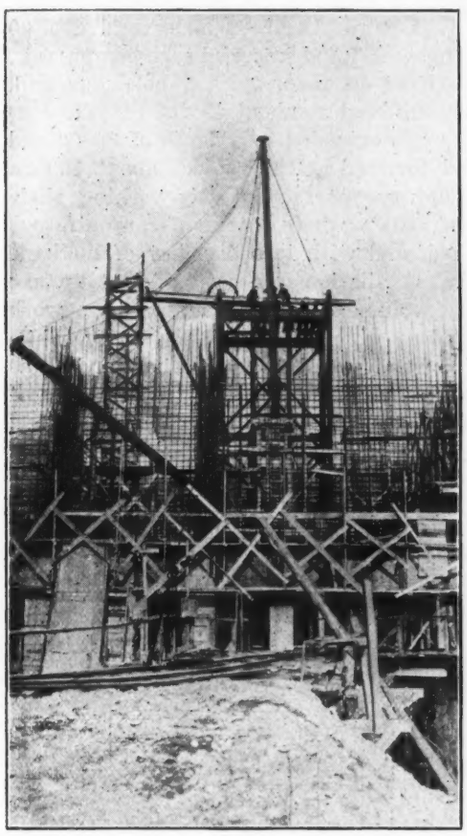
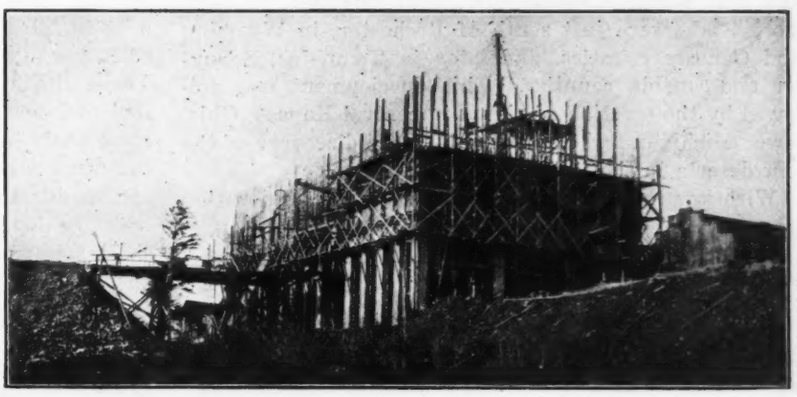
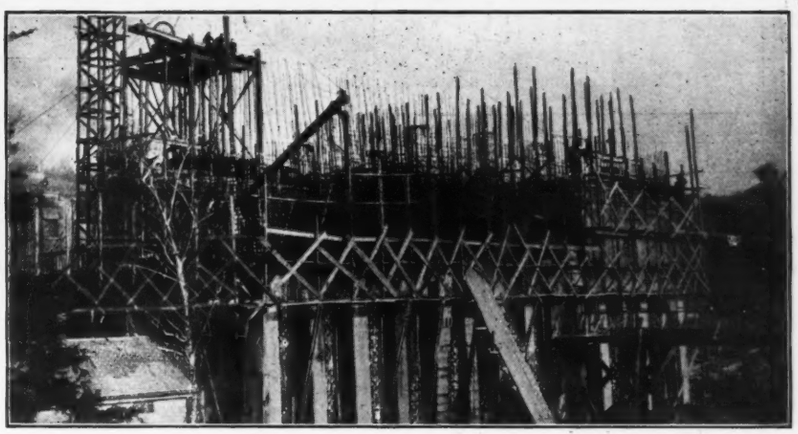






FERRO-CONCRETE CONSTRUCTION AT THE PLANT OF THE ROCK SALT CORPORATION, ITHACA, NEW YORK

Salt Mining and Dressing

BY J. B. CALKINS*

Brief history of the salt industry, with a detailed account of the mining and milling operations at a property in New York State. An output of 2000 tons of prepared salt per 10-hr. day is planned, shipping facilities for double that tonnage have been provided, and there will be storage capacity for 20,000 tons. The paper presents details as to haulage, dressing and mechanical equipment.

THE production of salt is of economic importance and a sure gage of industrial and social progress. Everything eaten has its portion of salt. The stock raiser must have salt for his cattle and sheep; the packer for his meat; the chemical manufacturer for sodium hydroxide, chloride of lime, other chemicals and asphyxiating gases; the textile manufacturer requires salt for his dyes.

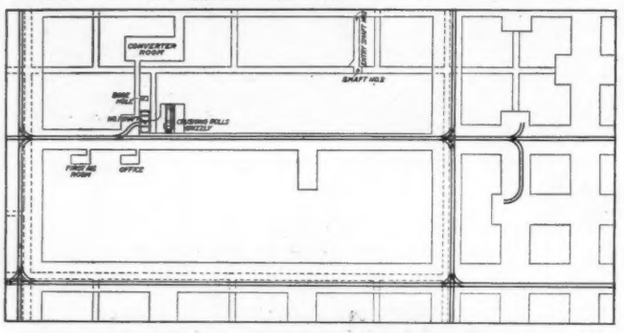
Some of the earliest developments in the mining industry were connected with the production of salt. History records that the Romans found the barbarians mining salt in central Europe before the Christian era. For hundreds of years the evaporation of salt from brine was unknown. It was then introduced into England and mine salt was dissolved in fresh water and then evaporated by the solar process.

Until the eighteenth century practically all the salt used in this country was imported from England. Nevertheless, as the frontier pushed westward in New York State, the settlers found that the Indians knew of a source of salt, and finally discovered that they were boiling down the water that issued from salt springs near where Syracuse is now situated. Until after the Civil War this district was practically the only salt-

*Assistant general manager and chief engineer for the Rock Salt Corporation, Ithaca, New York.

producing locality on the North American continent, and even then the greater proportion of the salt consumed was imported from Europe. With the introduction of the process by means of which fresh water is forced down through drill holes into the crystalline salt bed between the casing and the tubing, the dissolved salt in the form of brine returning through the tubing for evaporation, many new fields were opened, and salt plants erected. The first operated in New York State were just south of Rochester, in Wyoming and Genesee counties, and later in Tompkins, Schuyler and Oneida counties. This development was followed by the erection of plants in central Kansas, Ohio, lower Michigan and Louisiana; and the discovery of the salt deserts in the Southwest.

With low initial cost and cheap fuel, the evaporation process has supplied domestic needs and a large part



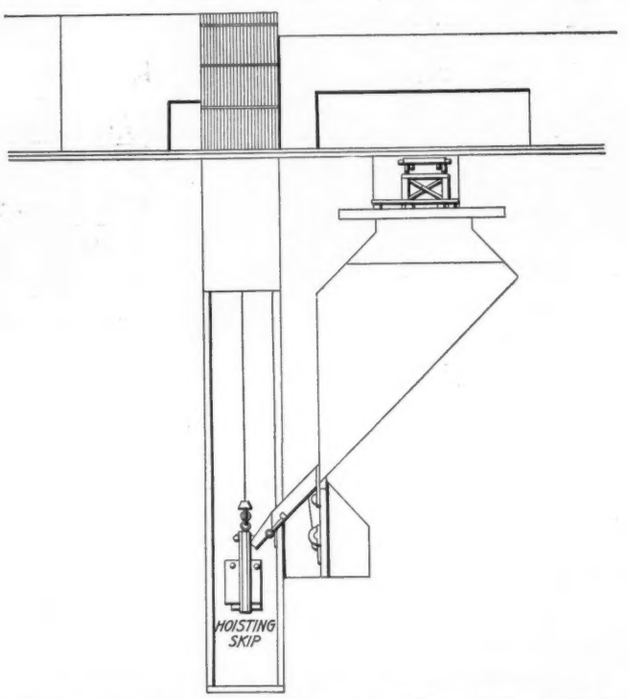
LAYOUT AT FOOT OF SHAFT

of the industrial business up to the present time; but with the ever-increasing costs and difficulty in getting coal (and it takes nearly a ton of coal to produce two tons of evaporated salt), mine salt is rapidly assuming a commercial status that will enable it to meet industrial needs and bids fair to encroach on the domestic trade. With this new and enlarging demand, the mine-salt industry has received a great impetus. One of the results is the opening of a new mine by the Rock Salt Corporation, near Ithaca, N. Y.

Salt beds in the East are generally fairly regular in their geological features and consist of horizontal strata from 10 to 50 ft. thick, with possibly a slight pitch to the southward. Nevertheless, where this corporation has sunk its shaft rather unusual conditions are found. In exploration, drillings were made about a mile on either side of the shaft site, and salt was found about 1400 and 1500 ft. from the surface, respectively; also water at about 1000 and 1100 ft. The shaft itself is situated between these two drill holes, and, although only 100 ft. from the shore of Cayuga Lake, is practically dry. What is more remarkable, instead of striking the usual 50 ft. of salt at the average depth of 1450 ft., it was found at 1365 ft. and consisted of an upper bed of 12 ft., then 41 ft. of mixed shale and salt in the middle, and 97 ft. of clear crystalline salt at the bottom, comprising one of the finest salt beds ever developed. The company contemplates working the lower 97-ft. bed.

After a thorough exploration, the company purchased title or mining rights on about 650 acres of land, including a mile front on the lake; and in July, 1916, began work on the shaft and breaker. The shaft is 9 x 21 ft. inside the timbers, and is divided into five compartments, namely, two skip roads 9 ft. x 5 ft. 8 in. each, one-man cage road 5 x 5 ft., an air way 4 x 5 ft., and a ladder way 3 x 9 ft., partitioned off between the skip roads and the remainder of the shaft to give up- and down-cast ventilation. The shaft is timbered throughout with 10 x 12-in. white oak sets placed on 6-ft. centers and lagged with 2-in. oak plank.

The actual shaft sinking was started early in September, 1916, with a 65-ft. wood headframe, a 12-in. x 18-in. single 5-ft.-drum Lambert hoist, and a 1100 cu.ft. per min. Ingersoll-Rand imperial-type compressor. Three shifts, each of 13 men, worked below ground. Bed rock was encountered at about 12 ft., but the concrete shaft collar was extended to a depth of 36 ft. and the work carried forward at the rate of about 100 ft. per month through comparatively easy-working shale rock to a depth of 840 ft., where a seam of carboniferous shale was reached, and with it a big flow of methane gas. The natural ventilation was not sufficient to take care of the large volume of gas encountered, so work at the bottom had to be suspended in July, 1917, while a 20-in. steel pipe was lowered down the shaft and a gas pump installed. In the meantime the wood headframe was replaced with the first half of a permanent steel



ARRANGEMENT OF CRUSHER, BIN, SKIP AND GRIZZLY

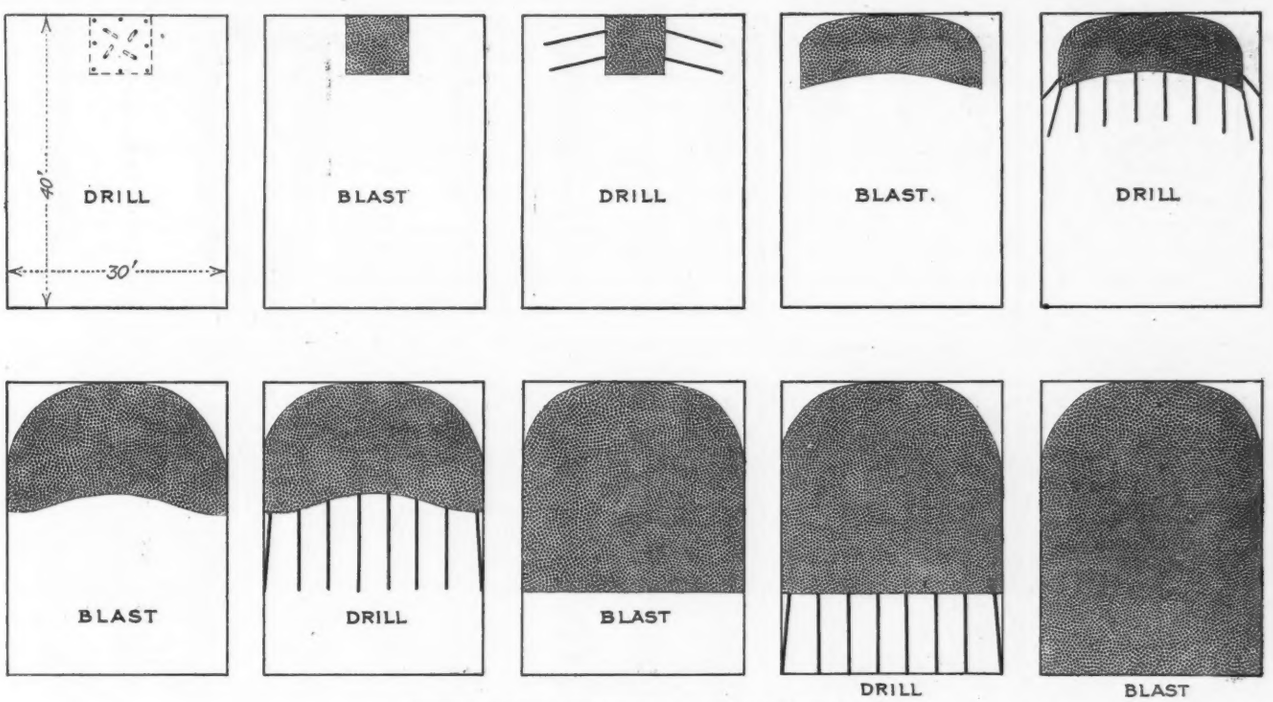
tower; and the final double drum, single-clutched, Vulcan electric hoist set up in the newly erected drum house.

Even with the improved ventilation system, it was impossible to take care of the gas, so grouting had to be adopted. This was accomplished in the following manner: First a 7-in. churn-drill hole was put down about 12 ft. from the shaft to relieve the pressure of the gas, and then 2-in. holes were drilled every 2 ft. around the outside of the shaft (at the bottom) into the gas fissure, and successively grouted with a thin paste of cement and water. The grouting was done with a grouting gun made of a length of extra heavy 10-in. pipe with caps at both ends, bored and tapped for a

2-in. pipe. First a short length of 2-in. pipe, tapered at one end, was driven tightly into the drill hole, and the gun was connected to this by suspending it with rope and tackle in the shaft with a valve between the gun and the grout tube. Next the gun was filled with water by opening it at the top, and a bag of cement dumped in. To get a good mixture, compressed air was forced in at the bottom of the gun and allowed to bubble up. When everything was ready to force the charge, the cap at the top was replaced and the 2-in. pipe connected to the water pipe leading down the shaft, and the gate valves in both the grout and the water line were opened. In this way the grout was forced in with the 300-lb. pump pressure at the surface, plus the static head of the water column down the shaft, giving a total pressure of about 700 lb. The valve at the bottom of the gun used for admitting compressed air for mixing the paste served a double purpose, for, while the grout was being forced in, this valve was left slightly open to indicate, by the presence of clear water, when the whole charge had been delivered. When completed, the valve in the grout tube was closed, so as to hold the charge in, and the gun moved over to the next tube.

By grouting about forty holes the gas was effectively isolated and shaft sinking continued without further difficulty. The effectiveness of the operation was admirably illustrated when the shaft was cut through the gas-bearing fissure, which was found completely filled with concrete across the entire section. The cement must have penetrated at least 12 ft. beyond the shaft, for it came out into the churn-drill hole and set so hard that the hole had to be reamed out before it could be carried down. Following about 80 ft. of carboniferous shale, which was really a low grade of coal (about 50% carbon), hard limestone was encountered, and the jackhamers for drilling had to be replaced with Leyner drills. On Jan. 1, 1918, the shaft had reached a depth of 1150 feet.

With regard to outside developments, it may be added that in the autumn of 1916 the company erected a 40 x 60 ft. stucco-tile repair shop, and equipped it with lathe, shaper, pipe machine, drill presses, grinders, and drill sharpener. This was followed by the erection of a 30-room boarding house and a well-equipped "dry" for the miners; also a large, double tenant house. The following spring a drum house was erected similar in size and construction to the repair shop, and grading was started for railroad tracks and the reinforced breaker building. During the latter part of last summer the foundations for the breaker building were laid, and at the first of the year it was nearly half finished. The breaker building will be of fire-proof, reinforced-concrete construction throughout, and will cover an area 90 x 120 ft., the average height being about 100 ft. The steel headframe is incorporated with the breaker and has a total height of 150 ft. Three loading switches will be carried under the breaker for loading bulk salt and one switch along the east side for package salt. With this arrangement the company hopes to be able to load from 60 to 100 cars per day. The breaker building incorporates not only the crushing and screening machinery but also storage for 20,000 tons of prepared sizes of salt.



SYSTEM FOR WORKING OUT GANGWAYS

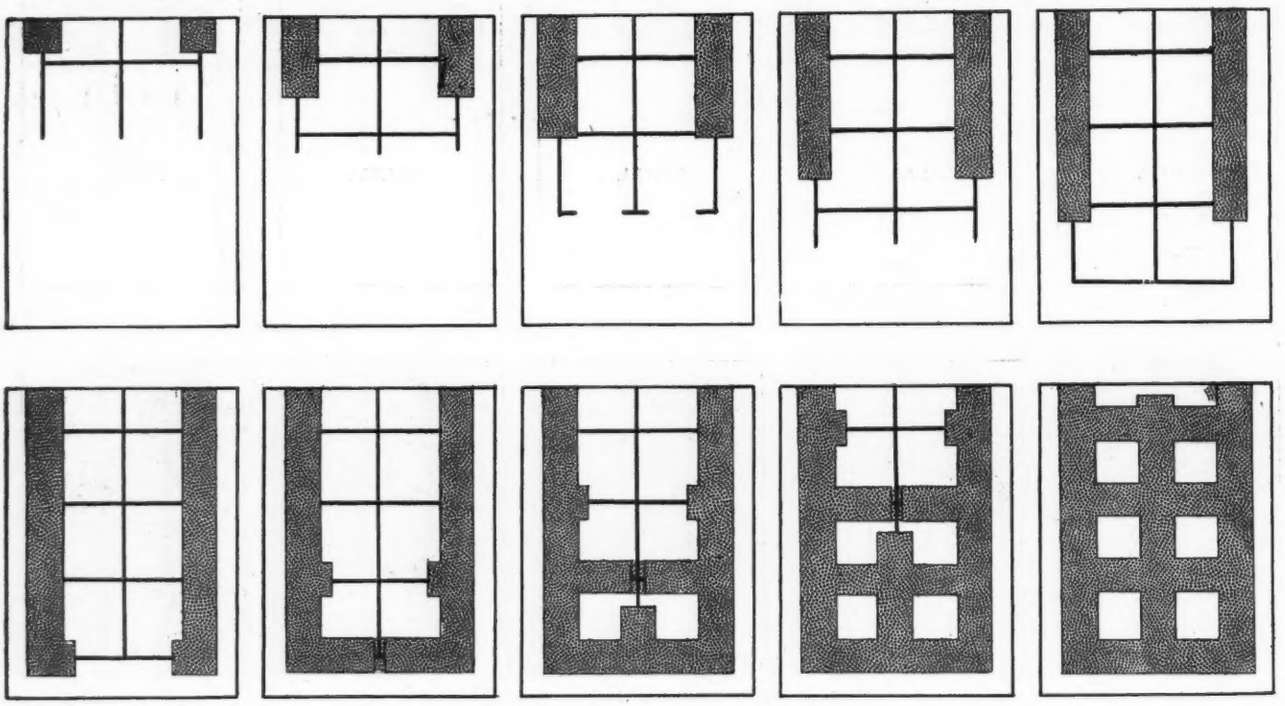
The character and nature of the salt deposit offer unusually favorable features for large-scale mining; for it is not only homogeneous, but can be mined in large chambers without timbering. With this in view, the company has purchased a large electrically operated Thew shovel, with a 1½-yd. dipper for loading the salt into the cars after it has been blasted from the face. There is also a smaller shovel of the same type, which is being used on the surface at present, but which will be sent underground when the mine is opened. Mechanical-shovel operation has led to the development of a rather original system of mining, so as to work out large gangways and at the same time get adequate ven-

tilation, especially after blasts. The entire output of the mine depends upon one or two large shovels, which will necessarily have to stand idle while powder gases are clearing from the workings. The system contemplated calls for taking out 40% of the salt in gangways 30 ft. wide and 40 ft. high, the remainder being left in the form of square columns 40 x 40 ft. for roof support.

To open the working face, an 8 x 8 ft. tunnel is driven ahead of the gangway, and later enlarged crescent shaped so as to open a regular bench system of quarry blasting, and also form an arched roof which can be readily trimmed without the use of stagings. Jackhamers can be employed to drill vertical holes 4 or 5 ft. from the face, and the salt blasted down directly in front of the shovel. This 8 x 8 ft. drift or tunnel serves a secondary purpose as a means of ventilation. The gangways are started 140 ft. apart, with an 8 x 8 ft. ventilation drift half way between them, which is connected with the down-cast part of the shaft. Every 70 ft., cross drifts are carried out at right angles to this ventilation tunnel, until they meet the drifts ahead of the gangways. Thus fresh air is carried from the ventilation fan down the shaft, through the center tunnel between the gangways, across to the drifts ahead of the gangways, and thence back directly into the working face. The foul air ahead is driven through the mine workings and up the shaft. As each succeeding cross drift is completed, the previously used one is bratticed up so as to force the air around through the new drift, thus always keeping it coming in from the front of the working face, instead of along the side.

When a gangway is completed as far as the property line, work is started on the last cross drift, and, when this is completed, back on the center air tunnel. This does not affect the ventilation system, for the fresh air is still coming directly into the face of the working; but it does reclaim the drifts, which have thus far been used only as a means of ventilation. It also possesses the advantage of a robbing-back system in which the men are always working under the heavily supported portions, instead of where the full amount of salt has been worked out. When completed, all the airways have been used as a means of working out a quarry face, and nothing is left but 40 x 40 ft. salt columns to support the roof.

The salt, after being blasted down from the working face, is shoveled into 6-ton dump-bottom cars, and hauled by electric locomotives to the foot of the shaft, where it is dumped on a grizzly. The oversize passes through a pair of 40 x 36-in. crushing rolls, which reduce the product to 4 in., and is stored in a 5000-ton skip pocket beneath. Thence it is spouted into 5-ton self-dumping skips and hoisted to the surface, where it goes through the breaker. Here it is reduced to 1 in. and screened for the four commercial grades—$\frac{3}{8}$ in., $\frac{1}{4}$ in., $\frac{1}{8}$ in., and common fine. The oversize passes through another set of crushing rolls, which reduce it to $\frac{3}{8}$ in., and over a second set of shaking screens. The entire breaker equipment is laid out in duplicate, and, with the exception of the distribution over the bins, the material is carried through by gravity.



PILLAR AND BLOCK SYSTEM OF MINING SALT

The hoisting equipment consists of a double drum 7 ft. diam. 4 ft. face single-clutched Vulcan hoist, equipped for shaft sinking, with double reduction gearing, and driven by a 100 hp. 550-volt alternating-current motor. With the completion of the shaft, the second set of reduction gears will be removed and the 100 hp. motor replaced with a magnetically controlled 500 hp. 2200-volt alternating-current motor. The hoist is equipped with automatic air brakes and all the latest safety devices for the prevention of overwind, overspeed, and reversal in case of failure of power. The 100 hp. motor taken from the Vulcan hoist will be used to convert the Lam-

bert steam hoist, on the man cage, to an electric hoist; but the steam rigging will be kept intact and boilers will be kept ready, so that the men can be taken out of of the mine in case of failure of the electric current.

Power is purchased from the Cayuga Power Corporation, received under a potential of 11,000 volts and transformed to 2200 for the large hoist and 550 for the smaller motors. Electric service for the mine will be carried down the bore hole as 550-volt, alternating current, and converted into 250-volt, direct current, at a substation below ground. All electrical equipment has been furnished by the General Electric Company.

The ultimate capacity of the plant will be 2000 tons of prepared sizes of salt per 10-hr. day, and it will have shipping capacity for twice that amount. Shipments may be made either in bulk or package, and by freight or water via New York State barge canal. The erection of the plant is under the general supervision of M. E. Calkins, A. S. M. E.; engineering design and purchasing, J. B. Calkins, M. E.; concrete construction, Alexander Shumway & Utz Co.; and steel work, Seneca Engineering Company.

Manganese Mining in the Magdalena Mining District, New Mexico

BY R. H. WEST*

The Magdalena Mountains of New Mexico are being prospected for manganese, and shipments have been made recently to the East by the Water Canyon Manganese Co., a local corporation, which has a manganese property in Water Canyon and offices in New York. The mine is situated 300 ft. up the east side of the canyon and is reached by wagon road. Entry to the mine is by tunnel, 125 ft. below the top of the canyon, which cuts a rhyolite flow that extends through four claims. The mine is equipped with track, cars and bins, and the principal ore produced is wad, an average sample of which runs 43% metallic manganese, 5.1% silica, with 0.025% phosphorus, the material making an ideal furnace ore. The wad is fine in texture and is shipped in canvas sacks, which average about 53 lb. each. At other mines in the district the ore is principally pyrolusite.

The workings from which the wad is mined show the mineral to be the filling of a natural cave, occurring in an extensive fractured zone in the rhyolite. The cave is 52 ft. across, 75 ft. high and 56 ft. long; and 28 cars of over 40% manganese have already been shipped. There is no waste to handle, no blasting is required, and the wad, after being dug out and shoveled into cars, is trammed to the bins for sacking. Cracks and fissures, varying in size from a few inches to three and four feet wide, extend in several directions from the cave, and in following these undoubtedly other caves will be encountered.

In prospecting the property, the locator followed the outcrop on an incline and struck the cave at about 18 ft. The soft, sooty material was not identified by him, so he threw it on the dump and was ready to quit before he was enlightened as to the value of the wad. After drifting 50 ft. in wad, he started a tunnel 80 ft. below the outcrop and to the south of the cave, ran east 50 ft., then turned north and struck the lower floor of the cave in 40 ft. This made it possible to remove the ore without hoisting and also open up bodies of milling ore. The headings and drifts are all in a fractured zone which shows mineralization, the milling ore running 20% metallic manganese, the remainder being silica and barium carbonate. The main drift on this level is over 150 ft. long, and three headings have been driven 50 ft. west, and raises 65 ft. high have been put up. Little work has been done to the east, although the east side of the main drift shows the fractured formation thickly coated with manganese. On the main level and east of the cave a 50-ft. winze has been sunk and shows the same conditions as the drift. The two drifts at the bottom, one going west and the other south, show evidences of other caves, especially as the manganese is of the wad character.

Extensive milling tests have been made of the low-grade ore, and experiments are being conducted to determine the best method of separation. Though there is an abundance of water on the claims, the experiments and tests show that the ore can be most efficiently concentrated by a magnetic process, although the manganese is of low magnetic quality. The Magdalena range is worthy of more attention, for it extends over 100 miles, with manganese showing in many places.

*Mining engineer, Carthage, New Mexico.

China's Effort To Combat Shortage of Silver

The scarcity of silver has been the subject of negotiations between the Chinese General Chamber of Commerce and the Shanghai General Chamber of Commerce, states a consular report. The foreign banks were of the opinion that there need be no anxiety, as the local holdings of silver on Feb. 13, 1917, were 22,000,000 taels and 15,000,000 Mexican pesos, and assured the native merchants that nothing will be done that will injure the local money market, and that no efflux of silver from China will take place, if the Chinese themselves will refrain from gambling on exchange.

New coins of 50, 20, and 10c. denominations were reported to have been put into circulation during the year, and they were to be accepted by all government offices at their full value, no discount being allowed. They were to be distributed through the Bank of China for circulation in Chihli, Shantung, and Honan, but should be accepted anywhere in China. They were, however, not seen to any extent in Shanghai, and it is doubtful whether the local exchange shops would accept them, as it would practically do away with their means of livelihood. In this connection it may be stated that for one Mexican peso the exchange is generally 112 to 114c. small coin in Shanghai.

A petition was submitted to the Taoyin of Shanghai and the Special Envoy for Foreign Affairs in May, requesting that an embargo be placed on the export of silver, as the continual outward shipment of silver seriously affected the tea and silk trades. It also requested that the mint at Nanking should turn out more silver dollars, and suggested that at least $4,200,000 should be minted at once, monthly, so that by the beginning of July the merchants would have enough silver to make their purchases.

The Blast-Furnace Charge at the Bunker Hill Smeltery*

BY C. T. RICE

This paper, the second article of the series, describes the composition of the charge and the handling of the various materials comprising it. A detailed description of the sampling plant and method of operation is followed by an account of the mechanical contrivances installed and other provisions made to insure accurate proportioning.

AN IMPORTANT change in the operation of the Bunker Hill smeltery resulted from the decision to obtain limestone for flux from a quarry opened by the company near the plant, and not to buy it already crushed from the source originally contemplated. As considerably more coarse ore has been received at the works than was anticipated, and as the matte return has been higher than it would have been if Bunker Hill & Sullivan low-zinc concentrates were the main source of the lead, a crushing and screening plant for breaking down the limestone is being installed alongside the sampling mill; and this will also serve for the coarse breaking of crude ore and matte before it goes to the sampling mill.

The material now treated at the Bunker Hill smeltery consists mainly of concentrates from the Bunker Hill and the Hecla mills, but some crude ore comes from the Hecla, as well as from the Sierra Nevada and the Caledonia mines. The supply is practically all sulphide ore or concentrates, and so has to be roasted. Oxidized ore, amounting to from 10 to 15% of the total, is received from the Caledonia mine. All ores, limestone, and coke for the smeltery are delivered at the top of the plant, where the supply warehouse is placed. The receiving bins are under the main tracks and alongside the primary ore bins in the gulch to the east of the works and at the top of the sampling mill. (See Fig. 1.) There are four receiving and eight primary ore bins, all of wood, and having a capacity of 250 tons each. At present the coke used at the plant comes from Utah. The current supply of ore is dumped into wooden bins on the west side of the

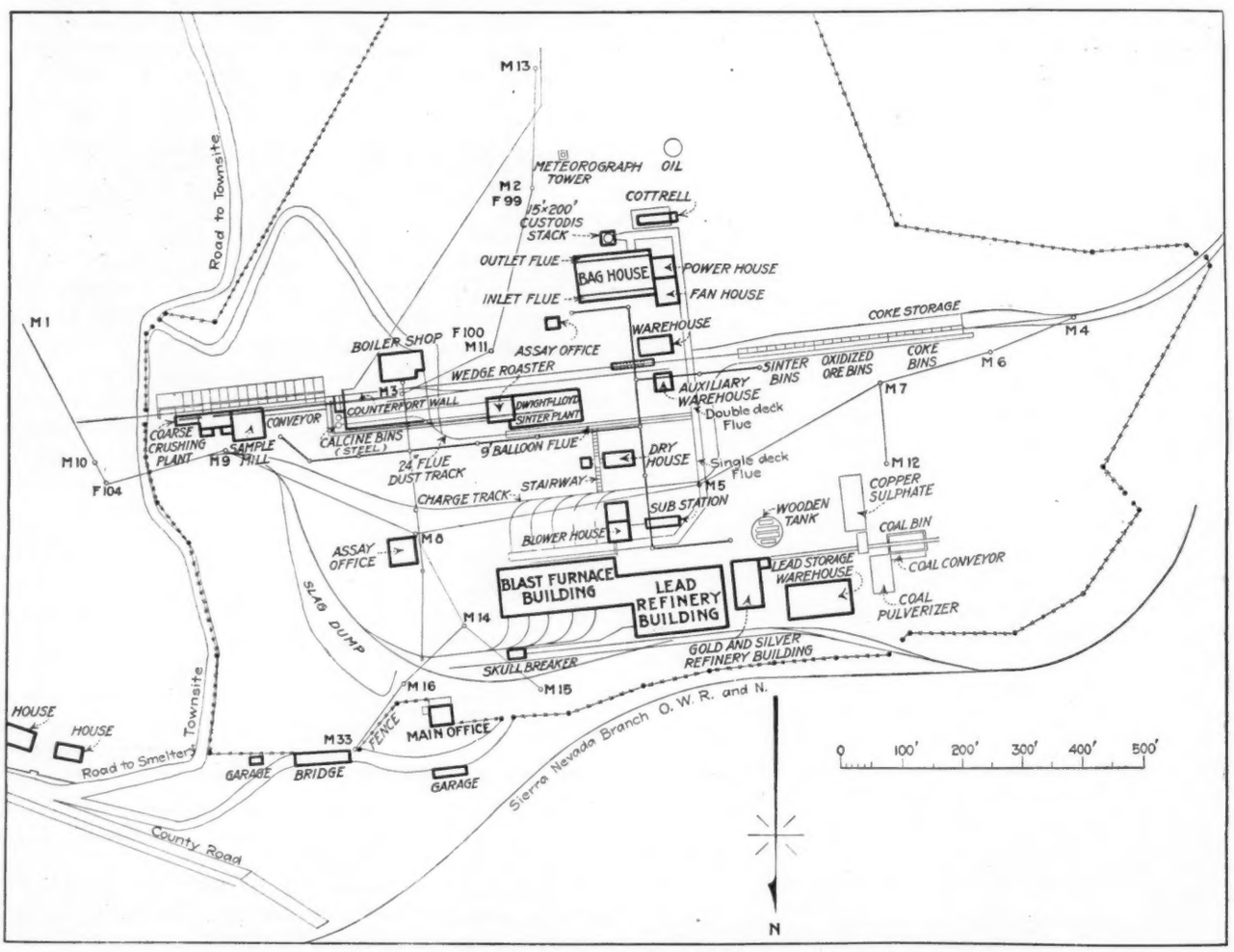


FIG. 1. ARRANGEMENT OF BUNKER HILL SMELTERY AND REFINERY

*The second of the series of articles on the design and operation of the Bunker Hill & Sullivan Smelting and Refining plant which began in the July 20 issue.

plant, where the blast-furnace charge is made up. The lime rock, which comes from the company's quarry near Ione, Wash., 200 miles from the plant, is also stored there. The necessity for procuring barren limestone for flux is one of the unavoidable drawbacks of the site, for the ores of the district contain practically no lime. As no ores with limestone gangue have been developed in nearby territory, this handicap will probably be a permanent one. Pyrite-magnetite gold concentrates come from the Alaska-Juneau mine, in Alaska; and these, together with old scrap iron from the mine and mill, contribute a considerable part of the iron needed as flux in the charge, although by far the greater part of the iron comes from Bunker Hill jig middlings, which material ranges in size from 15 mm. down, and so helps in keeping the sinter porous on the Dwight & Lloyd machines.

The ore as it comes to the plant is unloaded into one of four receiving bins, and from there goes to the sampling mill. Each bin has two mouths, closed with slats above and arc gates below. From the bins the ore is fed to a conveyor belt by a traveling apron feeder of rather novel design, which will be described more fully on another occasion. This conveyor is stopped and started by a switch from alongside the crusher, and by varying the throw on an eccentric the speed of feed is changed. It is, therefore, possible for one man to feed the ore from the receiving bins, and also to attend to the crusher.

Sampling the Ore

From the crusher, which is of the Blake type and breaks to 1½ in., the ore is elevated to the top of the plant, where, if it is oxidized, it is sent to the first Vezin sampler, which takes out a one-tenth cut. The sample goes down through the other samplers, just as in the case of sulphide ore, but the rejects from this first sampler go to an elevator, which discharges to a conveyor belt. This belt then takes the oxidized ore without further crushing to a car on the tracks outside, whence it is switched to the charge bins on the other side of the plant.

The sulphide ores are by-passed around this first sampler and go, instead, to a 4-mm. trommel, the oversize from which, after being crushed in rolls, is reëlevated to the same trommel, so that the circuit is closed. As the undersize discharges from the chute lips of this trommel, a Vezin sampler takes out a one-twentieth cut. The reject from this sampler is elevated to a conveyor belt and discharged by a Stephens-Adamson tripper into the primary ore bin selected to receive that shipment. The first twentieth cut then goes to sample rolls that crush to ⅜ in. From this pair of rolls the sample is fed by shaking feeder to another Vezin sampler that takes a one-twentieth cut. The reject from this sampling also goes to the conveyor belt and is taken to the primary bin to which the shipment is being sent; and the sample is reduced in bulk by being passed through Jones splits and then taken to the bucking room of the assay office for final crushing.

More coarse ore and matte has to be crushed at present in the sampling mill than was originally intended. An 18 x 30-in. crusher is therefore being installed just east of the sampling mill to do the preliminary breaking before the ore is taken by bucket elevator to the sampling mill. In this way the burden now thrown on the sampling mill will be relieved.

The success of any smelting operation depends largely upon the way in which the different ores are mixed at each step in the process. The mixing of the roaster charge at the Bunker Hill smeltery is accomplished in a somewhat similar manner as at the Tooele and the Northport smelteries, except that it is done more systematically and with better mechanical development of the same general scheme. The first mixing of the ores and calcines takes place on the conveyors in front of the primary and calcine bins. The roaster charge then gets a thorough mixing in the hoppers and pug mills of the Dwight & Lloyd machines; but previously,

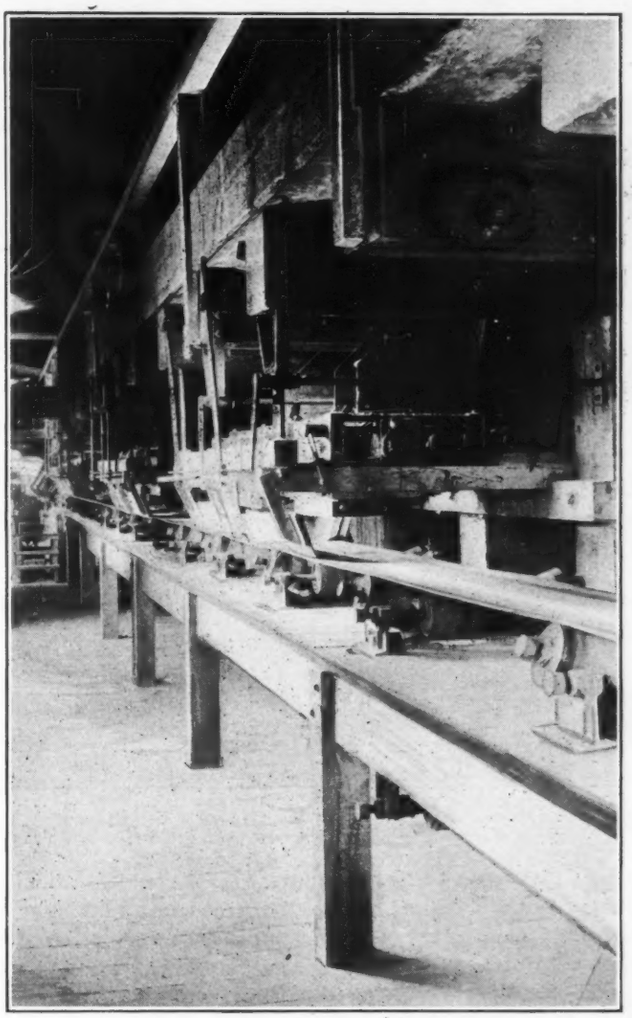


FIG. 2. BELT FEEDERS AT PRIMARY ORE BINS

the high-sulphur ore and matte receive a preliminary mix as they are being fed over the conveyor system to the Wedge furnace for a preliminary roast.

Finally, at the secondary bins, a thorough mixing of the blast-furnace feed is obtained while the various parts of the charge are being weighed out and bedded in the hopper of the charge cars. In this way a well-mixed and easily variable charge is obtained for the blast furnaces with a minimum of labor. As wages will probably remain higher than at other plants, such as at Salt Lake City, where a supply of smeltery labor is always available, any saving in this direction is important.

In order that the roaster charge may be proportioned accurately on the belts, it is necessary that the feeders at the different bins shall be capable of close adjustment. Each primary and calcine bin is provided with two belt feeders (see Fig. 2), one as a standby. Each feeder is driven independently by its own clutch from the feeder line shaft. The belt speed is kept constant for all feeders, and the amount of material from each bin is controlled by a handwheel and

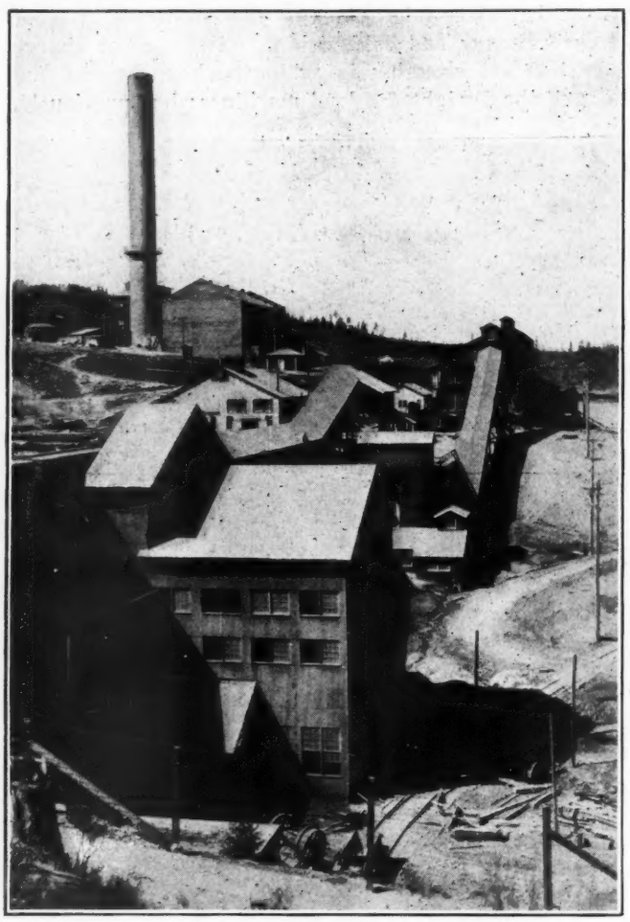


FIG. 3. SAMPLING MILL PRIMARY ORE BINS AND CALCINE BINS

lever system which raises and lowers a vertical slide-gate. As the sulphide ore is all crushed to a maximum size of 4 mm. in the sampling mill, close regulation is thus obtained.

The conveyor receiving the feed from the primary-ore bins delivers to a cross belt that takes the ore to the incline belt which goes to the top of the roaster building (see Fig. 3). Upon this cross belt the calcines are added to the roaster charge. These calcines are of two classes, and are stored in separate steel bins 10 ft. in diameter and 20 ft. high. The high-sulphur ores and concentrates that have been given a pre-roast in the Wedge furnace go to one tank bin. The clean-ups from around the Dwight & Lloyd machines and the different flues go to the other. Each bin is served with two belt feeders, similar in design to those used at the other bins, except that a longer and stronger lever is needed in order to enable the control screws to be placed over the discharge end of the feed belt. The adjustment screws should be arranged so that they can be operated from alongside the conveyor, both at the ore bins and the calcine bins, in order that the quantity of feed which comes from each bin can be easily and quickly changed. In setting these feeders so that they will take the exact amount of ore and calcines needed, the discharge from each belt feeder is caught in a box and weighed on a small platform scale. To enable the setting to be done easily and conveniently by one man, the unit selected in determining the different bin discharges is 20 lb. of feed to the belt in 15 seconds. Even when several units must be fed to the belt the weight of sample is small enough to be handled conveniently by one man. The analysis of the contents of the various ore and calcine bins being known, the charge sent to the roasters is easily fixed by determining the number of unitary quantities of feed to be taken from the various bins. As the roaster charge is revolved twice before it reaches the main incline conveyor, it is well mixed by the time it comes to the hoppers. The charge is weighed by a Merrick automatic belt scale en route.

Mexico Modifies Rules on Payment Of Overdue Mine Taxes

Ambassador Fletcher has recently transmitted a copy of a Mexican decree of July 19, published in the *Diario Oficial* of July 26, making certain modifications in the requirements for the payment of overdue taxes on Mexican mining property, according to *Commerce Reports*. The purpose of the present decree is to amend the decree of Apr. 26, one article of which provided that back taxes would be collected in installments of one-third, beginning with the second four-month period of 1918, at the same time as the current taxes. Failure to make the required payments would result in cancellation of the concession.

In place of the collection of one-third of the arrears, a new schedule is published providing for payments of smaller proportions varying according to the number of tercios (four-month periods) for which the taxes are due. The arrears of longest standing are subject to the smallest percentage of payment. The schedule follows: On three to five tercios, 25%; on six to eight tercios, 20%; on nine to eleven tercios, 15%; on twelve to fourteen tercios, 10%; and on fifteen tercios and over 5 per cent.

Further requirements are that payments for the current tercio, with the required surcharge, be made before Sept. 1, and that the mining claims to which the payments apply be actually worked before Dec. 31, 1918. Proof of compliance with this ruling must be submitted to the Treasury Department, supported by affidavit from the local authorities and confirmed by the Department of Industry, Commerce and Labor.

Mexican Currency.—It is proposed to authorize the circulation of American gold and silver as legal tender in the states of Sonora and Sinaloa until such time as the old mint at Culiacan, capital of the latter state, can be put into operation, states the *Mining Journal*. The plant is now in preparation, and the bullion produced in the rich mines of that portion of the republic will be coined and put into circulation with as little delay as possible.

The Position of the Quicksilver Producers In California

Quicksilver producers and miners in California appeared at a conference held in San Francisco on June 26 before U. S. Tariff Commissioner William S. Culbertson and Guy C. Riddell, the consulting metallurgical engineer of the commission. The meeting was attended by 41 representatives of quicksilver producers, allied industries and Government bureaus. H. W. Gould, general superintendent of the New Idria Quicksilver Mining Co. and the Sulphur Bank Association, was spokesman for the quicksilver producers represented. The conference, which assumed a discursive form, was participated in by Edmund Jussen, of the New Almaden; Murray Inness, of Oceanic and Oat Hill; H. C. Davey, of Guadalupe; Earl B. Crane, of Black Butte; Clifford G. Dennis, of St. Johns and Nevada Mercury; Andrew Rocca, Jr., of the Great Western Mercury Co.; Dr. H. L. Duschak, of the U. S. Bureau of Mines; F. L. Ransome, of the U. S. Geological Survey, and Walter W. Bradley, of the California State Mining Bureau. The report that follows is substantially in the language of Mr. Gould and includes answers to questions and important suggestions made by those present. The position taken by the producers was that an adequate tariff on quicksilver importations is vital if domestic production is to be maintained. Very low-grade ores and increase in operating costs are the two factors that make the future of quicksilver mining uncertain.

AT AN informal meeting of quicksilver producers I was asked to present to the conference the necessity for a tariff on quicksilver after the war and to state the amount that would be necessary to protect the industry—assuming that our costs remain as they are at the present; and it is hardly possible they will be as low. But, assuming that the post-war costs are the same as now, it is the opinion of the majority of the producers represented here that a protective tariff of at least $35 a flask, in addition to the present 10% *ad valorem*, will be necessary to protect the American producer from foreign competition and to keep the production where it is today. This does not mean that some companies cannot otherwise work at a profit. Some of them will drag along for a long time, providing the operating costs are reduced and the price of quicksilver does not come down as quickly. It does mean that the domestic production will fall below the low level of 1914 in California.

The estimate of a $35 tariff is based on a $70 to $75 cost per flask in this country as compared with the price at which Spain lands quicksilver in New York, or $40 a flask. Immediately after the war little decrease in the Spanish price is to be expected. What Spain can then produce it for, we do not know. But we do know that if we had their orebody over here we would produce quicksilver profitably at $10 a flask. There is no question that they can do the same, with their cheap labor. It is a question whether they will or not. According to their contract, the Rothschilds must sell quicksilver for $35 per flask and no less. The difference between $35 and $70 is the amount of protection necessary for the American producer; but this would leave him no profit at present. The Government price is now $105 per flask. What it is in the outside market I do not know. In 1914 the price was $41.

The average cost of production and net prices received during the last 10 years (1908-1917) are given in Table I. The industry continued during that period,

TABLE I.—AVERAGE CALIFORNIA COST OF PRODUCTION AND NET PRICES RECEIVED FOR QUICKSILVER, 1908-1917

Year	Cost, Per Flask	Selling Price, Per Flask
1908	$25.91	$40.42
1909	27.53	40.04
1910	25.58	43.29
1911	26.53	41.65
1912	31.64	38.69
1913	30.72	36.58
1914	51.96	41.00
1915	55.51	74.21
1916	47.50	89.54
1917	68.66	92.70

but production was greatly reduced. The quicksilver mines will not be able to produce after the war at these or any other prices near them, on account of the added cost of production and because the mines will have been depleted during the period of the war.

It is hardly necessary to review the history of the quicksilver industry prior to the outbreak of the European war, although it is well known that the United States dropped from the leading producer of the world in 1904 to a poor fourth in 1914, and were it not for the war the industry would probably now be defunct, as our low-grade ores could not be expected to compete with the high-grade ores and cheap labor of Spain, Italy and Austria. With the advent of the war, the advance in the price of the metal stimulated production, which in 1917 reached a total more than twice that of 1914. This took place in spite of wide price fluctuations that discouraged producers from prospecting.

Probably over 90% of this increased production was made from mines that were in operation before the war and a few new mines and prospects that have been opened since. Very few of the quicksilver mining companies launched since 1914 have been financially successful. The increased production has been made from a gradually diminishing grade of ore and at a continually increasing cost. The present cost of $70 to $75 per flask is still increasing at an alarming rate.

The Tariff Commission has probably at hand an article written by Dr. Ranier in 1914, and describing the status of the quicksilver industry in Europe at that time. The Almaden mines, in Spain, owned by the government, were at that time producing quicksilver from 11% ore at a cost of less than $16 per flask. The mines were operated from October to May each year, and by the crudest methods produced 30,000 to 42,000 flasks per year.

The contract of the Spanish government, sole owner of the Almaden mines, with the Rothschilds dates from Jan. 1, 1912, and is effective for 10 years. Of the total annual production, 500 flasks are reserved for the national industries of Spain. All other production is included in the contract. The contractor binds himself to sell, in London, the greatest possible amount of mercury, at a price exceeding £7 per flask. In return he receives a commission of 1.25% of the net value of the sales; 6s. for each flask transported to London, and 10% of the sales price above £8 2s. on any sales above this price. This information was obtained in a personal communication from Señor Don Manuel Albacete, sub-director of the Almaden mine.

According to this, the world prices are not fixed. The London market is considered the standard; but the prices on that market affect the American price only in proportion to the imports. I do not know, and do not think any one else can state positively, whether any of the Italian product reaches London. Early in 1916, during the high prices caused by the shortage of metal in this country, much quicksilver was imported from Italy and some from London. Prior to the war the Italian quicksilver mines were controlled by Germans. Whether most of the quicksilver went to Germany is not known, nor is it known what has happened to those mines since the outbreak of the war. We know that the metallurgical methods in Italy and Austria were far ahead of ours at the beginning of the war. And we understand that in Austria, as in Spain, the mines were worked directly by the government, and the industry was fostered in every way. The methods of production both in Italy and Austria were efficient. In Spain they were very inefficient, but they had high-grade ore there, which, on account of cheap labor, was worked at a low cost in spite of the crudest of methods. The furnaces used at the Almaden mines were invented in Peru in 1634 and introduced into Spain in 1646. The original furnace erected in 1646 at Almaden was in operation in August, 1914.

This indicates that their cost of production must have been relatively high, but even with these inefficient methods they were producing at a cost of less than $16 a flask prior to the war. It also shows how much lower in cost they could have produced quicksilver with greater efficiency in their operations. Besides that, Dr. Ranier, in describing the orebodies, states that ore has been developed that will produce an annual output of 1000 tons of quicksilver for 40 years. This is equivalent to 30,000 of our 75-lb. flasks per year for 40 years. The Almaden mines have been producing for more than 2000 years. The deposits are apparently inexhaustible. Dr. Ranier says that the orebodies are better at the present depth than in previous years at places nearer the surface. The main orebody has an average assay value of 14 to 15% mercury, and the two northerly orebodies, which are not so large, carry a lower grade of ore, the assay indicating as low as 2.5% mercury. I do not think there is a gentleman in the room that knows what 2.5% ore is. I am sure I do not. The Spanish production during recent years has equalled 11% mercury recovery.

In comparing the European mines with the American mines prior to the war, the average mercury content of the Spanish ore was 11%; Italian ore, 1.0%; Austrian, 0.85%. In America the probable average was 0.40%. The Austrian ore is about twice our grade and the Italian a little more than twice. To put it another way, the Italian and the Austrian ores contain about 17 lb. mercury per ton, against about the 6- or 8-lb. content of the ores of the United States. In Italy, although the average ore is about 1%, operators have large orebodies that average 30%, and most of their production comes from the high-grade ores.

Dr. Ranier gives no cost-per-flask figures for Italy or Austria. Although the ore in these countries is lower grade than the Spanish ores, the superior methods practiced in Italy and Austria give producers there a much lower cost than we can hope to attain in America. Though we do not know what the conditions will be in Italy and Austria after the war, it is reasonable to suppose that Spain can and will, if allowed, deliver quicksilver in the United States at less than $40 a flask. The Spanish producers have every advantage. They have large orebodies, described as being 8 to 14 m. (20 to 40 ft.) wide. There are few orebodies in this country that are being worked to that width. They have cheap transportation, cheap labor, and their timber costs are practically nil. The ore is soft enough to break well, and the walls are hard enough to be self-supporting.

The only advantage we have is in more efficient methods of reduction. There is no doubt that the stimulus of increased price in the last four years has greatly increased the production in Spain, and possibly the costs are greatly reduced. There is no reason why they should not be. Both Italy and Austria had efficient reduction methods, though we believe Italy to be in advance of Austria. The mines in both countries were operated in accordance with German methods. A new furnace was being installed in Austria in 1914 with a capacity of 140 tons a day. It was twice as large as any furnace in operation at that time and would greatly decrease operating cost. As a rule, our methods were far behind the practices in both Italy and Austria before the war.

Comparative Costs at New Idria Mine

The New Idria summary of comparative statements for 1914 and 1917 is presented in four tables: Table II, production and sales; III, tons treated, costs and prices; IV income and costs, and V, comparative prices of supplies.

TABLE II.—NEW IDRIA QUICKSILVER PRODUCTION AND SALES, 1914 AND 1917

	1914
Production, flasks	6,550
Sales, flasks	6,725
Average price	$41.00
Net proceeds of sales	$275,629.12
Net loss	45,010.28
	1917
Production, flasks	11,000
Sales, flasks	11,435
Net proceeds of sales	$1,059,919.55

The charge of $1.50 per ton for depletion in 1917 is decided upon in the Eastern office of this company. As I understand, it is for the depletion of the mine. I think that it is based on an assumption of 10 years' life of the property. We could charge that off in one year, and the next year probably we would not be operating. The condition of quicksilver mining in this country has been such that the feeling is that as soon as the war is ended we will be through. The depreciа-

tion charge is for new equipment and was initiated in 1916. In that year we made several new installations, and at the time started a depreciation charge, which amounted to less than $15,000, as shown in the figures for 1917. The overhead charge includes certain taxes and salaries, as well as the general expenses of the

TABLE III.—TONS TREATED, COSTS AND PRICES, 1914 AND 1917

	1914	1917
Tons treated	62,578	125,445
Flasks produced	6,550	11,000
Pounds produced per ton of ore	7.8	6.58
Cost per flask	$51.96	$68.66
Cost per ton treated	5.44	4.50
Price received per flask	41.00	92.70
Price quoted	48.31	106.30
Difference in price	7.31	13.60

Eastern office. I think that it does not include interest on investment. The interest charge is interest on balances in the bank and overdrafts. We are not always on the right side of the ledger. In fact, being on the wrong side of the ledger is a chronic condition with a quicksilver mine.

Prospecting is charged to operation account. In quicksilver mining there is continual prospecting. It is not

TABLE IV.—INCOME AND COSTS, 1914 AND 1917

1914		
Gross income		$298,567.57
Labor, commission, etc.	$229,499.42	
Repairs	25,741.28	
Fuel, power, light, etc.	18,443.18	
Supplies	40,893.97	
Overhead	20,000.00	343,577.85
Net loss		$45,010.28
1917		
Gross income		$1,062,778.59
Labor, commission, etc.	$363,157.94	
Repairs	49,250.06	
Fuel, power, light, etc.	35,000.00	
Supplies	165,668.50	
Depletion	188,167.50	
Interest paid	1,513.59	
Overhead	25,000.00	
Depreciation	14,344.72	847,602.31
Net profit		$215,176.28
Federal income taxes for year 1916		7,414.54
Balance		$207,761.74
Reserve for federal taxes, 1917		60,991.18
Net income, 1917		$146,770.56

like a gold mine, where a large shaft is sunk that can be charged to the plant account. In 1914 from 25 to 33⅓% of the New Idria cost was for prospecting. Extensive prospecting has been carried on year after year. Except in long tunnels and deep shafts, this cost should be charged to operation. The condition in the quicksilver industry which justifies this charge is the nature of the

TABLE V—COMPARATIVE PRICES OF SUPPLIES, 1914 AND 1917

Supplies:	1914	1917	Increase, Per Cent.
Fuel oil (f.o.b. wells) per bbl.	$ .37	$ 1.65	35
Lumber (f.o.b. cars) per M	13.25	26.00	98
Iron and steel	....	....	85
Hardware	....	....	50
Explosives, powder, per 100 lb.	11.00	21.00	90
Manganese steel, per lb.	.10	.22½	100
Mining machinery	....	....	75
Pipe, etc.	....	....	100
Cable	....	....	85
Labor (common), per day	2.00	6.50	225

deposits. The ore is found in small pockets and small orebodies, as a rule. All the mines spend a large amount each year in prospecting. Perhaps in the last year or two some of the mines spent much more than they did before the war. In our case, instead of trying to find new orebodies, we made an attempt to profitably work the low-grade ore by increasing our tonnage.

The report of the Sulphur Bank Association, submitted to the commission, shows that this property, in Lake County, was leased in May, 1917. A camp was established in July and production began in September. The production in 1917 amounted to 342 flasks, and for the first half of 1918 amounted to 660 flasks, a total of 1002 flasks. The tonnage treated in 1917 is not reported; but in the six months of 1918 the total material treated was 39,262 tons, producing 1.26 lb. mercury per ton. This is the lowest-grade ore handled in the United States, or probably in the world, at the present time. The operating account in 1917 covering the production of 342 flasks amounted to a total of $26,445.08, or a per-flask cost for operation of $77.325.

The construction account for 1917 includes the following: Construction of mill, $12,405.71; retorts, $6599.03; kiln, $2020.93; miscellaneous, $5699.07; motor truck, $4111.45; steam shovel installation, $1745; total, $32,581.19. The maintenance account for the same period was $1509, making an aggregate cost of operation, construction and maintenance of $60,535.27. Additional construction in 1918 brought the total plant investment to $71,022.90 by July 1, 1918.

The financial statement from May 9, 1917, to Jan. 31, 1918, shows quicksilver amounting to 275 flasks (on hand and unaccounted for) out of a total production of 517 flasks. The sale of 242 flasks was made for a total sum of $24,521.90, or an average price of $101.33 per flask.

The labor cost at the Sulphur Bank is probably a little lower than at the New Idria, as the large part of the cost is for steam shoveling, motor-truck hauling, etc. Labor costs are figured on tonnage of ore rather than per flask of metal produced. Taking the total costs at 100%, the cost of labor in 1917 would be about 43% of the whole. This includes superintendents and all other salaries at the mines. I have no estimate of the labor costs per flask in Spain or Italy.

Concentration at Sulphur Bank

The Sulphur Bank mine is equipped with a 500-ton concentrating plant. The ore is mined by steam shovel and hauled to the plant by motor truck a distance of one-fourth to one-half mile. The concentrate is roasted in two Johnson-McKay 12-pipe and one set of 5-D retorts. A rotary furnace is under construction and two more are contemplated for directly retorting the ore. The mine has large bodies of very low-grade ore containing 0.05%, or one pound of quicksilver per ton. It is capable of large production provided an expensive plant of sufficient size is installed and the price obtained for quicksilver will cover production. The present milling plant is successful as a sizing plant, and, as shown by my report to the company in February, the mill recovery ranged from 30 to 50%. The tailings are stacked and will be later roasted in a furnace. The retort plant is satisfactory as far as it goes, but it was evident from the start that a larger retort capacity would be needed.

On account of the free sulphur contained in the ore, a Scott furnace is unsatisfactory. For this reason a small rotary-kiln type of furnace was designed and is now being installed. It is probable that a larger furnace will be necessary to get results. Much depends on the rotary kiln now being tried at the New Idria and the small one at the Sulphur Bank. If these kilns are

unsuccessful, we will have to improve our milling methods, retort the concentrate and repair one of the old Scott furnaces to burn the tailings and trommel reject.

The grade of the ore is better than expected, and the metallurgical problems so far are not insurmountable. The development on a large scale will depend primarily upon the operating equipment. The Sulphur Bank deposit cannot be compared to any other deposit in the country; it is entirely on the surface, and consists largely of dumps of material that had been mined years ago and then discarded as waste. It carries a large amount of sulphur. The recovery is low, amounting to 1.29 lb. per ton. The cost last year was $193 per flask, including the cost of installation and operation.

Furnace Tonnages and New Installations

The largest tonnage treated in a Scott furnace, so far as I know, is about 75 tons. It can treat a larger tonnage, but we have not tested it. Few mines in this country would be able to stand a larger tonnage. Prior to the war any one who had the money to buy a Scott furnace larger than 75 tons did not have a mine that would support it. At present, on the low-grade ores, if we were sure of the price of quicksilver, we could afford to build larger installations. We are building at New Idria a larger installation of a different type of furnace, a rotary revolving furnace following in design the type used in the cement industry. We have one in operation and are building several more. It is at present regarded as promising, but time will tell. We may get a lower cost. The labor cost at least will be lower, but fuel will be high, because oil must be used. Fuel-oil prices have increased from 37c. to $1.65 per bbl., which makes a large difference between the before-the-war period and the present.

The new installations include the completion of the Idria tramway, five rotary kilns with condensing system, and electric power line and electric motors, three belt conveyor systems, and thirteen surface buildings.

Future of Concentration Methods

I do not see any future for the concentration of quicksilver ore. I may be wrong. There have been probably 12 plants built since the war started, but of that number I think the New Idria and the Sulphur Bank are the only ones that are now running. I do not consider them a success, except that it is possible to get larger production right now if recoveries are not considered. The recovery in the concentration of quicksilver ore is low. Sometimes at the Sulphur Bank we were not making a 50% recovery. Our recoveries ranged from 30% to 50%. The concentrate can be treated in a Scott furnace by retorting a very low-grade concentrate mixed with the ore. It is so fine that we can retort only a certain amount at a certain time. We cannot retort very fine ore in a Scott furnace. In the event of successful concentration, it would not necessarily mean the adoption of retorts, but rather the adoption of a type of furnace different from the Scott.

I do not know of any high-grade ores in this country that are now inaccessible, but that would be available for mining after the war, in case prices are maintained at a profitable level. Since the war, the production has come almost entirely from the old mines. I know of few new prospects that look favorable and, so far as my knowledge goes, there is no inexhaustible supply of low-grade ore. I think the New Idria has the largest deposits of low-grade ore that are developed; whether we can work the amount of low-grade ore developed or not depends upon the price of the metal. The estimate last year showed our average ore reserves to be about 5.5 lb. per ton. At present it would be difficult to work profitably 5.5 ore. Whether there is a possibility of a permanent quicksilver industry in the United States, cannot be easily answered after examining all of the facts. So far as I know, there are no large reserves of ore that would insure production for any period of years under any circumstances. We could for a period of two or three years make even an increased production, if absolutely necessary, regardless of costs; but beyond that it would not be safe to make an estimate.

After the War

I do not say there will be no quicksilver production in this country after the war, but it will be small and below the 1914 level if producers receive anything like the 1914 prices. This will be due not to the 1913 tariff, but primarily to the decrease in the grades of ore in California. In 1914 the production in this state was 11,000 flasks, 6550 flasks of that amount coming from the New Idria. That company lost $45,000 in the year. During the period of the war we are going to exhaust our mines as far as possible, working them to an extent they have never been worked before. We have increased production, and high prices have warranted working the low-grade ores. After the war, if prices drop and costs do not decrease, it is easy to see where we stand, without an adequate protective tariff. The grade of ore will be on the average about one-half the average of that before the war.

Mine Foreman's Relation to Employees

By A. L. H. Street*

In a suit brought to recover damages for injuries to plaintiff, who was injured by a fall of rock in defendant's mine while operating a compressed-air drill after having been assured by a shift boss that the place was safe, it was claimed by the defendant that the shift boss and plaintiff were fellow servants within the rule of law, still applicable in many jurisdictions, that an employer is not liable for injury to an employee, resulting from carelessness of a fellow servant, excepting where it is shown that by reason of known incompetence or habitual negligence of such fellow servant the employer may be found to have been negligent in retaining him. But the U. S. Circuit Court of Appeals, Ninth Court, overruled this claim, holding that the shift boss must be regarded as the representative or alter ego of the employer, especially in view of an intention to make him the arbiter of the safety of working places manifested by a rule adopted by defendant mining company to the effect that each miner must assure himself of the safety of his working places, notifying the foreman or shift boss, if necessary, to remove the danger arising from any unsafe condition found. (Anderson *vs.* Federal Mining and Smelting Co., 247 *Federal Reporter*, 472.)

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Recovery of Selenium and Tellurium In Copper Refining

BY M. H. MERRISS* AND H. T. BINDER†

Methods of recovering selenium and tellurium from electrolytic slimes are suggested, and flow sheets are given showing the various sources of these two products. The precipitation of tellurium oxide is accomplished by sulphuric acid and the oxide is produced by carbon. Selenium is precipitated from solution by acid in the presence of sulphur dioxide. Preparation of commercial forms of selenium and tellurium.

MOST of the commercial crude copper bullions now being produced contain selenium and tellurium in quantities varying from minute traces to two-tenths and three-tenths of 1% and upward. In melting the pigs of crude copper and the subsequent casting into anodes, little of the selenium and tellurium is driven off. In the electrolytic tank-room operations, none of the selenium or tellurium is acted upon, and, in common with the gold, silver, etc., it drops to the bottom of the tanks, so that for all practical purposes it may be considered that all the selenium and tellurium entering a refinery in the copper are concentrated in the electrolytic slimes.

The methods for working up slimes vary somewhat in the different refineries, so that the accompanying flow sheet (Fig. 1) has been made up as a sort of composite of all methods, with special reference to the manner of getting the selenium and tellurium in condition for recovery in each method. For "selenium and tellurium" the word "selenium" alone has been substituted in the flow sheet for brevity. Each important source of selenium and tellurium is numbered, to be taken up in more detail subsequently, the less important sources being merely indicated on the flow sheet and not used commercially as far as is known. At present they are sources of selenium loss, as indicated.

Referring to the flow sheet, Source 1 is shown as coming from "niter slag." The object of cupeling the treated slimes is to obtain the elimination of practically all the elements from the slimes except gold, silver, platinum, palladium and a little copper, which are produced in the form of doré for further refining and separation. This elimination is accomplished by first liquating off a leady and antimonial slag. Then by blowing air through the charge, "flapping" with rabbles, and often by the addition of sand and lime to the charge, a second slag is formed carrying the bulk of the copper, together with a large proportion of the remaining impurities, but most of the selenium still remains with the noble metals. Sodium nitrate and sodium carbonate are then added, and the blowing is continued, resulting in the formation of a "niter slag," containing the selenium, largely in the form of sodium selenite. This slag is skimmed off, cooled, and easily broken up into small lumps, and leached with hot water either in an iron or concrete tank, the sodium selenite going readily into solution. The solution is decanted or filtered off and the leached slag put back into the anode furnaces or in some other way treated to get its high silver content back into the process.

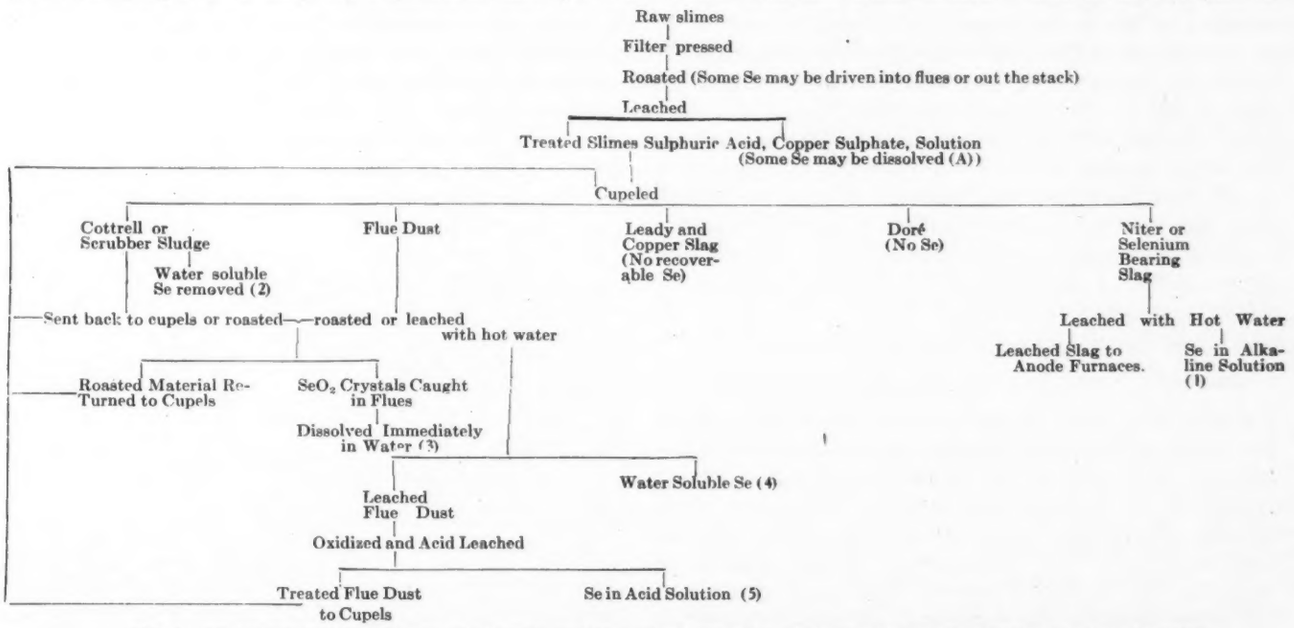
Raw slimes
Filter pressed
Roasted (Some Se may be driven into flues or out the stack)
Leached
Treated Slimes Sulphuric Acid, Copper Sulphate, Solution (Some Se may be dissolved (A))
Cupeled
Cottrell or Scrubber Sludge
Water soluble Se removed (2)
Flue Dust
Leady and Copper Slag (No recoverable Se)
Doré (No Se)
Niter or Selenium Bearing Slag
Sent back to cupels or roasted
roasted or leached with hot water
Leached with Hot Water
Leached Slag to Anode Furnaces.
Se in Alkaline Solution (1)
Roasted Material Returned to Cupels
SeO_2 Crystals Caught in Flues
Dissolved Immediately in Water (3)
Water Soluble Se (4)
Leached Flue Dust
Oxidized and Acid Leached
Treated Flue Dust to Cupels
Se in Acid Solution (5)

FIG. 1. TREATMENT OF COPPER REFINERY SLIMES, WITH SPECIAL REFERENCE TO SELENIUM AND TELLURIUM

NOTE.—The copper-acid solution at (A) containing Se must be completely freed from this element by boiling with copper scrap, scale, shot, etc., before it can be returned to the tank room for further use in copper refining. If the Se is not removed all the copper in the tank room immediately becomes extremely rough and impossible to refine economically.

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†Assistant superintendent, electrolytic refinery and silver departments, Raritan Copper Works, Perth Amboy, New Jersey.

Tellurium accompanies selenium in all these steps, also concentrating in the "niter slag." The hot-water leaching of this slag tends to dissolve the selenium rather more rapidly than the tellurium, so that a rough preliminary separation of the two elements can be made at this point. Further, it is more difficult to get all the tellurium in such a slag in the water-soluble form, so that usually from 15 to 35% of the tellurium is returned to the anode furnaces unleached.

Source 2 is shown as coming from the "Cottrell" or "scrubber sludge." Most slime refineries are now equipped with scrubbers for washing the gases after they have passed through the flue system from the cupels. Some of them also have Cottrell apparatus installed for the same purpose. In either case it is usually necessary thoroughly to saturate the gases with water, the recovered wet and sloppy sludge being later filter pressed. The water which has thus been in intimate contact with the hot gases and with the sludges, thoroughly leaches out the water-soluble selenium, and in an ideal plant the same water would be circulated over and over again through the washing apparatus, so as to keep concentrating in selenium. As will be shown, this is a cheap source of the metal and should not be overlooked by allowing these waters to run to waste. Little, if any, tellurium can thus be obtained.

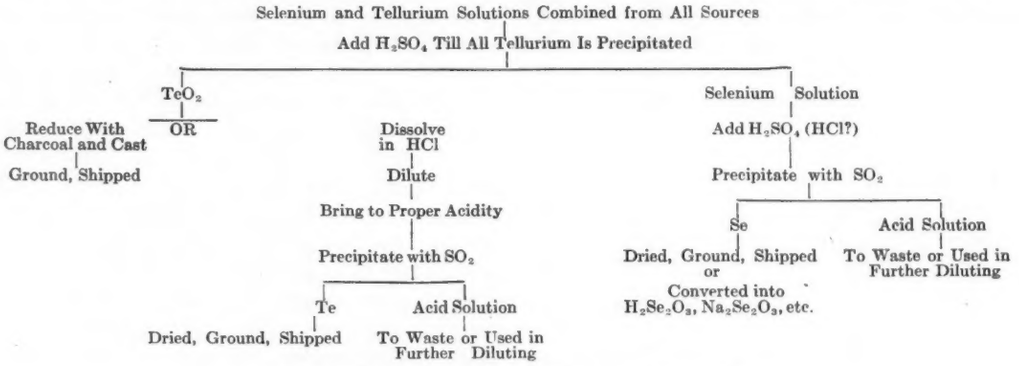


FIG. 2. SEPARATION OF SELENIUM AND TELLURIUM

Recovery From Roasted Sludge or Flue Dust

Source 3 is quite generally used. Both the regular flue dust and the filter-pressed sludge can be roasted at a low heat, driving off selenium, which can easily be condensed in suitable chambers, as practically pure crystals of selenious oxide (SeO_2). These crystals can then be collected and are almost completely soluble in water, if care is taken to treat them while fresh and not allow them to stand around. If they are stored, there is some reduction to metallic selenium, which is insoluble. In Case 3, again, this source does not apply to tellurium, as little tellurium gets into the flue system at all. Instead of roasting the flue dust, the water-soluble selenium in it may be extracted by leaching with hot water, forming Source 4.

There is usually present in the flue dust a good deal of non-water-soluble selenium. This may be extracted by oxidizing it and leaching out with acid, forming Source 5. In this process strong sulphuric acid is added to the wet water-leached flue dust. Then the oxidizing material, such as sodium chlorate or chloride of lime, is added, a little at a time, until the selenium has been oxidized. This must be done carefully to avoid excessive amounts of chlorine gas being given off. The selenium then goes into solution in the sulphuric acid, and the clear solution is either decanted or filtered off, the leached flue dust being returned to the cupels.

In case the source of commercial selenium recovery at any plant is either 2, 3, 4, or 5 or any combination of these, there is usually no necessity of a tellurium separation, inasmuch as there will be little tellurium present. All that is necessary is to pass a current of sulphur dioxide gas through the solution, bringing down the selenium as a red powder, which may be dried and prepared for shipment as subsequently described. In most cases, however, Case 1 is the main source of selenium, and here a separation from tellurium must be made (see flow sheet, Fig. 2). This is done by adding sulphuric acid to the strongly alkaline sodium selenite and sodium tellurite solution, causing the precipation of white tellurous oxide (TeO_2).

Reaction: $Na_2TeO_3 + H_2SO_4 = Na_2SO_4 + TeO_2 + H_2O$.

Generally all or some of the other methods of getting selenium are also practiced. All of these except Source 3 contain sulphuric acid in varying amounts, so that if these solutions are combined with the alkaline sodium selenite solution, a considerable economy results, part of the neutralization being effected by the acid solutions. During the precipitation, which may be conducted in any lead-lined tank, the solution is kept boiling and agitated with air. The hot solution causes better settling later. The acid is added, carefully toward the last, as long as any TeO_2 comes down. An excess of acid will redissolve TeO_2; also, if the reaction is allowed to proceed too rapidly, the tank will boil over violently. After the acid is all in, the contents of the tank are allowed to settle, and the clear solution is withdrawn, filtered and led to the selenium-precipitating tank. The tellurous oxide is washed on a filter and either thrown away in case tellurium is not being sought, or treated for tellurium as described later.

The precipitation of selenium is effected by passing a current of sulphur-dioxide gas through the selenium solution in a lead-lined precipitating tank, which is preferably made fairly deep for more thorough utilization of the gas.

Reaction: $Na_2SeO_3 + 2SO_2 + H_2O + H_2SO_4 = Se + Na_2SO_4 + 2H_2SO_4$.

In order to obtain a satisfactory and economical precipitation, it is necessary to have at least 10% of free sulphuric acid present, and in some cases also a small amount of hydrochloric acid. As fast as the sulphur dioxide is passed through, selenium comes down in the

form of a red slimy powder, and after complete saturation of the solution at least 98% of the total selenium has been precipitated. Any of the common kinds of sulphur burners now on the market may be used for making the sulphur dioxide, but it is essential that an efficient scrubbing device be connected up to the burner to keep sublimed sulphur out of the distributing system. In some cases a pressure pump is used for drawing the gas through the scrubber and forcing it through the precipitating tanks. The sulphur dioxide, further freed from moisture and other solids by a separator also introduced into the line, is led into the precipitating tanks either by means of perforated lead pipes near the bottom of the tanks, or through glass tubing.

The time required for precipitating is dependent upon the speed with which the sulphur is burned, the absorbing power of the solution, and the strength of the solution in selenium, and it varies widely. The theoretical amount of sulphur required is 64 lb. per 79 lb. of selenium, but in practice from 1 to 2 lb. of sulphur is used per pound of selenium. The precipitated selenium is removed to a lead-lined wash tank and washed by decantation or on a filter until free from sulphuric acid. The water must be filtered to keep out iron rust and other sediment. Then the selenium is thoroughly boiled, which changes it to a granular black mass. This is transferred into lead trays, which are placed on shelves in a steam drying oven. The dried, black selenium is then ground to such fineness as desired and sold in this condition. Sometimes orders are received for cake or stick selenium, in which case the black selenium is melted direct into the desired form.

Preparation for Commerce

Purchasers sometimes ask for red selenium. In that case the red precipitate, after thorough washing, must be separated from the surplus water by some form of press. The semi-dry cake of material must then be broken and dried in the dark by means of a current of cool, dry air. Light, and even summer heat, will darken it while any moisture remains. After thorough drying it may be packed in dark, air-tight containers and should be kept in a cool place.

Some purchasers desire sodium selenite (Na_2SeO_3) and there is also a limited demand for selenious acid (H_2SeO_3). In either of these cases black powdered selenium is converted into the salt specified by a suitable chemical process. The starting point for both is a strong selenious acid solution, which is made by treating the selenium with concentrated nitric acid. Selenious acid crystals are obtained by evaporating this solution, and sodium selenite crystals are made by neutralizing it with caustic soda, and evaporating the solution formed. In either case the process, through simple chemically, involves considerable manipulative difficulty, and each of the successive evaporations and dryings must be carried out with precise attention to detail in order to obtain a marketable product.

The starting point in the manufacture of tellurium is the tellurous oxide obtained by precipitation from the sodium selenite and sodium tellurite solution. As shown on the flow sheet, tellurium may be made either by the dry or by the wet method. Taking up the dry method first, the tellurous oxide is carefully dried and intimately mixed with a pulverized reducing agent, as lamp black or ground charcoal, and subjected to a low heat in a suitable furnace, ranging from the small crucible type to a large tilting retort type. All possible precautions must be taken to avoid loss of tellurium, as the high losses are the great disadvantage of this method, even under the best conditions. The tellurium mixture must be kept carefully covered, and a low and well-regulated heat maintained. The proper temperature is about 900-1000°F. The tellurium recovery varies from 50 to 95%. The proper proportion of reducing agent to crude tellurous oxide by weight is from 3 to 5%. The reduced tellurium is cast into any rough form and can easily be ground to powder for shipment, or, if desired, remelted and cast into cake or stick form.

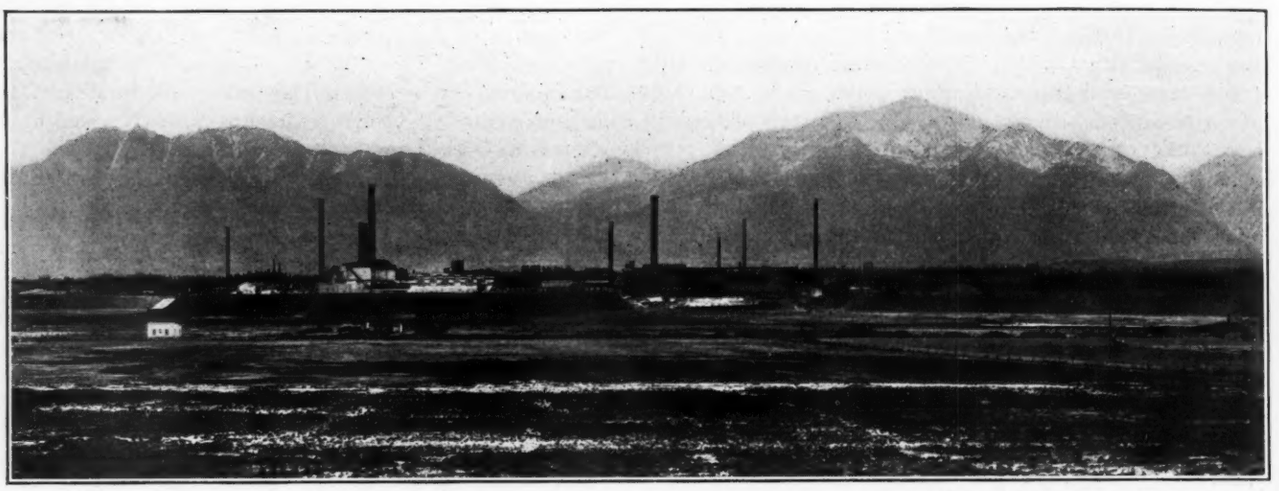
If the wet method is to be used, the tellurous oxide is dissolved in strong hydrochloric acid, about 4 lb. of commercial acid being required per pound of dry tellurous oxide. If sulphur dioxide is passed through this strong solution, however, only a small portion of the tellurium will be precipitated, so it becomes necessary to dilute. Great care must be taken not to reprecipitate tellurous oxide, which can be held in suspension if the proper acid conditions are maintained. The solution of tellurous oxide in hydrochloric acid is treated in exactly the same manner as the tellurium-free selenium solution and in the same or similar apparatus; sulphur-dioxide gas is passed through it, precipitating the tellurium as a blackish-gray powder, which is then washed free from acid solution, dried and ground for shipment, or else cast into ordered forms.

The dry method is quicker and more direct, but the loss is great and the fumes are objectionable. The cost of oil, charcoal, crucible or retorts, and grinding for the dry method about balances the cost for acid, excess handling, and sulphur dioxide for the wet method, though on the question of purity of product there is little to choose between the two processes.

Wolfram Ore in Swatow District, China

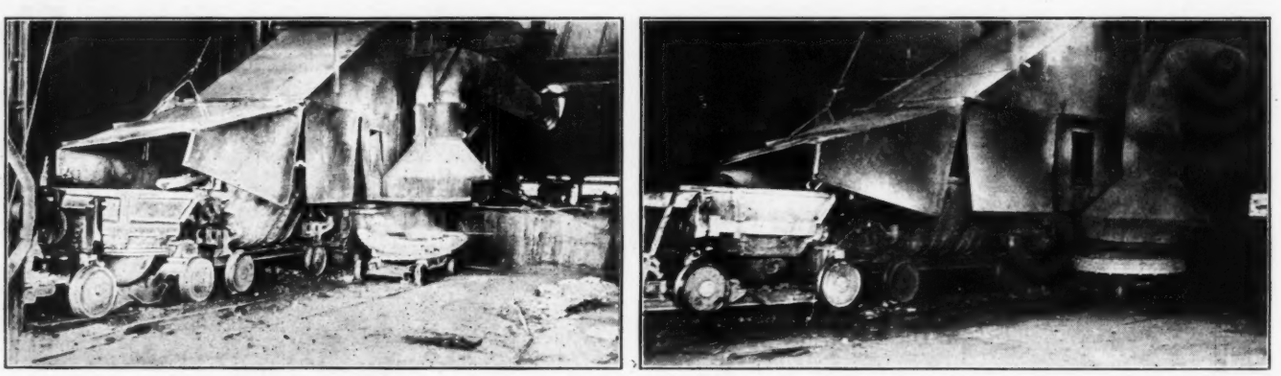
Wolfram ore has been found in the districts of Haifeng, Lufeng, P'u-ning, Kityang, and Wuhua, in China, at first in small quantities here and there on the surface of the ground, but recently in vein deposits, writes Consul M. S. Myers in *Commerce Reports*. The Wuhua district (old name Changlok) appears to contain the largest deposits of this mineral. A group of villages about Tung-ling-hsia, among which are Chiu-lung and Ho-tung, is the principal center of production. This particular area is said to cover six or seven square miles, and it is here that the ore is found in large veins. It is claimed that over 2000 booths have been erected as shelter for the people who have flocked there in search of "black gold," as it is commonly called by the natives. This area is about 50 miles northward from Hopo. Other centers of production are Hei-lin, in Wuhua district, and Tai-yong, in Kityang district. A large market center for wolfram ore is Waichow, and there is little doubt that much of the ore mined in this district reaches that place. With the development of the Wuhua and Kityang fields, Swatow's importance as a market will increase, as it is the natural place of export for these districts.

Smeltery Treatment of Fume and Smoke

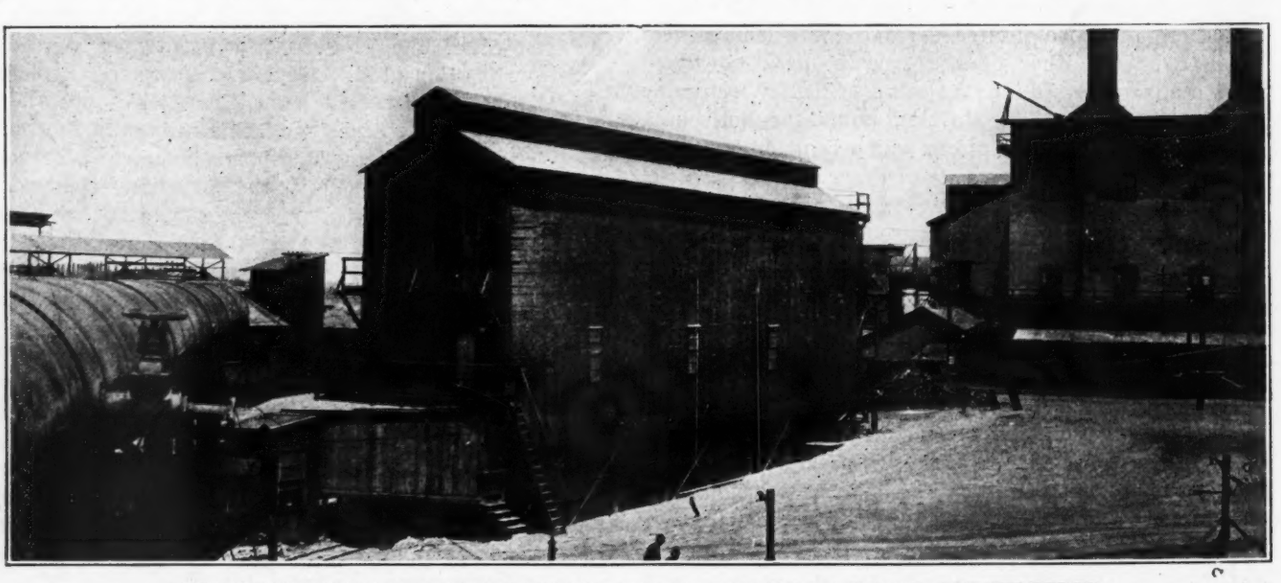


SMELTERY OF UNITED STATES SMELTING, REFINING AND MINING CO., MIDVALE, UTAH, IN OPERATION

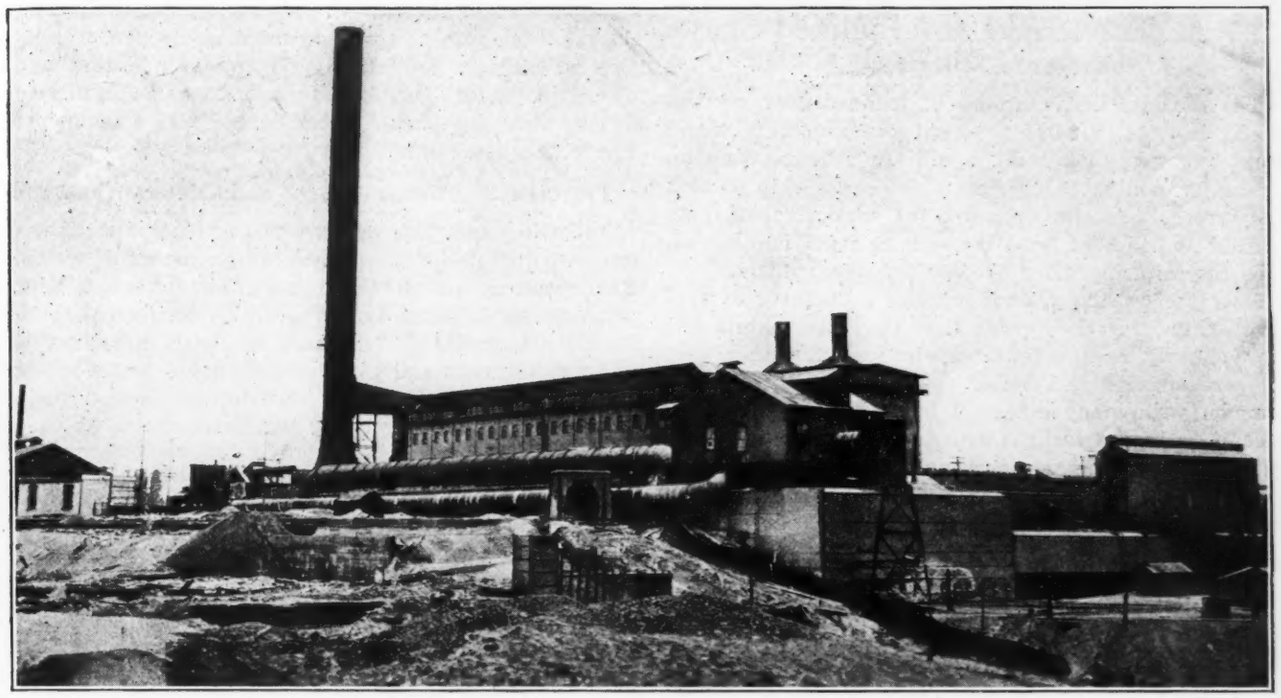
For years the Midvale Smeltery has been foremost in the prevention of damage done to vegetation from smeltery fumes and gases. The Sprague process for neutralizing sulphur trioxide by means of finely powdered basic oxides was developed here and has since been used at several other plants. Zinc oxide was originally added almost exclusively, although now finely powdered hydrated lime is mainly used, owing to the high cost of the zinc oxide. The smeltery gases discharge from the stack carrying only about one-third of 1 per cent. sulphur dioxide



HOODS OVER SETTLERS AND MATTE CAR IN BLAST-FURNACE BUILDING OF MIDVALE SMELTERY



HOOD BAGHOUSE IN WHICH GASES AND FUMES, CAUGHT BY HOODS, ARE FILTERED

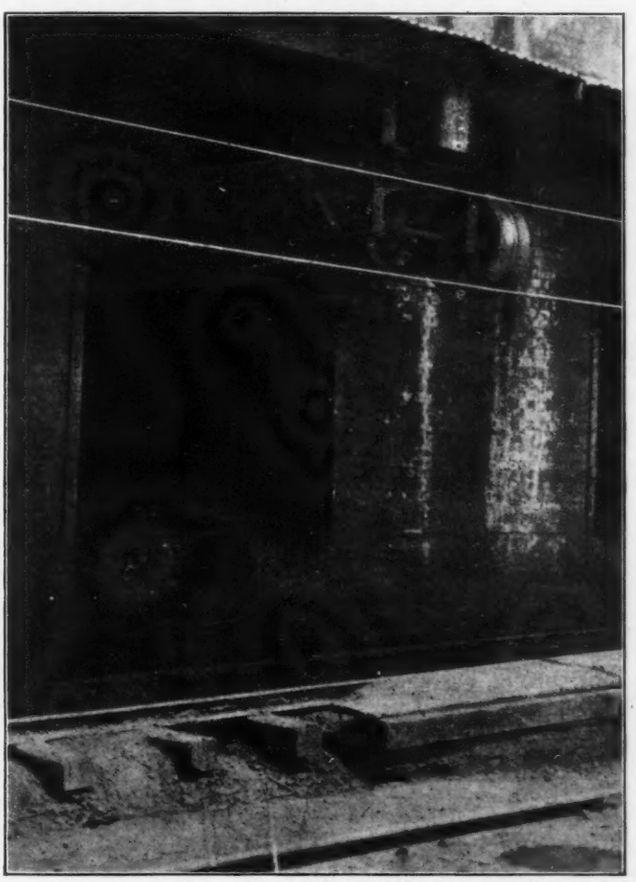


MAIN BAGHOUSE AT MIDVALE SMELTERY OF UNITED STATES SMELTING, REFINING AND MINING COMPANY

The baghouse sections serving the Dwight & Lloyd sintering machines and the Wedge furnaces are at the stack end; at the blast furnace end are the sections which serve the blast furnace. To the side and in front of the baghouse are shown the fan house and the settling chamber. Woolen bags are used in the roaster sections, cotton bags in the blast furnace sections. The blast-furnace sections discharge the filtered gases, consisting mainly of carbon dioxide, into the air from low chimneys, whereas the roaster sections connect with the main stack itself.

HOODS FOR DWIGHT & LLOYD SINTERING MACHINES

Hoods are provided at the Dwight & Lloyd sintering machines to prevent fumes and sulphur smoke from escaping while the fine ore is being sintered. One large hood is provided at the discharge end and two small ones are at the fire-box end.



SCREW CONVEYORS USED TO CLEAN FUME

Bags in the main baghouse are cleaned by deflation by means of an auxiliary fan, one section being deflated at a time. Deflation is a quicker method and causes less deterioration of the bags than mechanical or hand shaking.

A New Timber Set for Inclined Shafts

By James E. Harding*

The theoretical advantages of inclined over vertical shafts are too obvious to merit discussion, it would seem. The inclined shaft is able to follow a vein on its dip, remaining at a proper distance for skip pockets and crosscuts to the vein, but the vertical shaft gets further and further from the vein as depth is attained, thus necessitating more expense for development.

Nevertheless, the general practice is in favor of vertical shafts, for the reason that they are maintained more cheaply, require fewer repairs and altogether tend to more efficient and better operating conditions. In common with many others, I have, at various times, encountered a few inclines with their attendant troubles, but, in spite of this, my personal preference favors the incline, because I believe the difficulties connected with it can be overcome.

Failure of the Old Method on the Comstock

An incline set designed to overcome the weakness of the old method was worked out and installed, and is illustrated in the accompanying sketch. The new design was a result of observations of four different inclines at the south end of the Comstock Lode, in each of which the timbering had loosened and slid to the bottom of the shaft in a hopeless tangle. In each case the timbers were of hard pine, 12 x 12 in. square, framed as an ordinary drift set, with the posts placed perpendicularly to the plane of the dip of the incline. The ground in which the shafts were sunk was hard but swelling, and it is assumed that the timbers were blocked as carefully as possible. The result was the same in all cases. Owing to weight and friction, the timbers on the foot wall remained stationary, and because of their own weight and the pressure of the ground behind them, the timbers on the hanging wall had moved along the line of least resistance, namely, down the incline. This movement was not uniform in all sets, some being held more firmly than others or subjected to less pressure, so that in some cases a set would pull away from the one above it, making a gap, which permitted the upper set to fall as soon as it started moving. The final result of this action was the collapse of the entire timbering.

Mine Timbers Always Compression Members

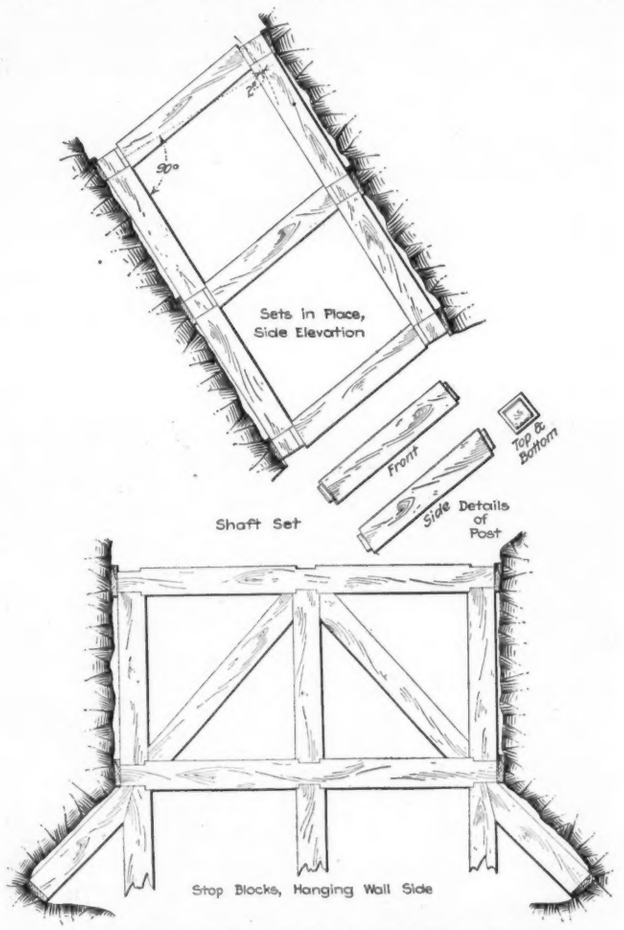
Perhaps this is an opportune time to point out that mine supports, except in the newer steel construction, are entirely composed of compression members, and that no matter whether the member is simply a stull or a seven-piece set, such as is used in the Overman mine at Gold Hill, Nev., all timbers must be compression members, if they are to stay in place. When by chance a timber becomes a tension member, it simply loosens and falls out of place.

As stated, all incline timbering had failed along the southern part of the Comstock, and when it became necessary to retimber one of these inclines, I began to study the matter with the view of designing a set which would not be subject to the catastrophies which had overtaken the former work.

By resolving into vectors the various forces involved in incline shaft timbering, and solving for their component, then placing the component in its proper relation to the former timbering, it was found that any opposition to the component made an angle of nearly 60° to that component, which clearly was contrary to correct mechanical principles.

The New Set Wedges Itself as It Takes Weight

Following this idea, sets were constructed with the post occupying the position of the component vector. This resulted in a weird-looking affair for a set, with posts nearly 16 ft. long to give the desired room in the compartments. The posts required sharp bevels and met the caps and girts at very acute angles; they were difficult to place and immediately showed their improper design by promptly buckling as soon as they



DETAILS OF THE HARDING TIMBER SET FOR INCLINED SHAFTS

took any weight, but they buckled up the incline instead of down.

From this fact it was seen that there must be some common point between these two extreme types of set that would give the maximum of strength. Finally, the set illustrated in the accompanying sketch was designed and installed. It is really very simple, and departs but slightly from the original standard; the only difference is in the posts, the caps and girts remaining the same as in the original sets.

A formula could be worked out for the bevels on the posts, but there seems to be no necessity for it. To make the original pattern for the posts, the bevel is merely adjusted so that when the post is in place its

*Care of American Smelting and Refining Co., Casilla 49 D, Santiago, Chile.

top is higher up the incline than its bottom, and when the top starts moving down, with the bottom remaining in place, the post becomes the radius of a circle and tends to describe an arc along the hanging wall. Starting in with the original position of the post, a chord of this circle should be 2 in. away from the circumference of the circle at its greatest distance. This point is illustrated in the sketch.

The advantage of this design is that, while the timber moves, it becomes tighter and tighter, and the caps cut into the blocks or the posts will break. A set does not depend upon any other for its supports, and each set becomes the key of an arch. In all cases the resistance increases as the pressure increases, and this was the result desired.

Since the original installation of this timbering I have had occasion to use it in one other inclined shaft, with satisfactory results. Sets of the new design cost no more to cut or install, and seem to be several times more efficient than the old.

Sulphur in Jemez Canyon, New Mexico

By Philip S. Smith*

Small deposits of sulphur have for some time been locally known in Jemez Canyon, Sandoval County, New Mexico. The deposits occur in two places, one in the Canyon de San Diego Grant, about five miles above Jemez Springs, nearly three-fourths of a mile below the forks of the creek, and the other at Sulphur Springs, in the Baca location, about 14 miles above Jemez Springs. The nearest railroad points are Bernalillo and Albuquerque, on the Atchison, Topeka & Santa Fe R.R., about 45 and 60 miles, respectively, south of Jemez Springs by the wagon road. The road for much of the way is heavy with sand.

The sulphur ore at the deposit first named, which may be called the San Diego deposit, consists of residual material from carboniferous limestone leached by acidulated waters and permeated by sulphurous vapors, which have deposited free sulphur in the crevices and pores of the upper few feet of rock. The deposit at Sulphur Springs is similar except that it occurs in rhyolite. About two miles above Sulphur Springs, and at several places in Jemez Canyon between Sulphur Springs and the lower deposit, hot springs or leached rocks indicate similarly active waters and vapors on a smaller scale. Hot sulphuretted water also occurs at Jemez Springs. These phenomena occur in a zone more than 15 miles in length along the general line of Jemez Canyon and suggest the occurrence of a deep fracture or group of fractures in the earth's crust along which acidulated waters and sulphurous vapors have risen and deposited sulphur.

The San Diego deposit is about 700 ft. long and 150 ft. wide, comprising a lenticular area including about one acre. Two smaller areas, 50 ft. or less in diameter, were noted in branches of a small tributary canyon about three-fourths of a mile to the northwest. The sulphur is irregularly deposited and is relatively thin, measuring only 2 ft. 4 in. to 3 ft. 4 in. in thickness in four cuts in the more promising parts of the area. In one cut the deposit was not penetrated at a depth of 4 ft. 2 in. The sulphur ore contains from 15 to 39% of free sulphur mixed with sulphate. The rock under the ore contains no free sulphur, but carries about the same percentage of sulphur combined as sulphate.

The deposit at Sulphur Springs occupies about nine acres in a small basin eroded in rhyolite. All the sulphur at Sulphur Springs was apparently deposited in vents, cracks, and pores within a few feet or a few inches of the surface. The available sulphur in this area is not large and is irregularly distributed. Sixteen years ago M. S. Otero built at Sulphur Springs a mill equipped with a boiler, engine, pump and two retorts of about one ton capacity each, for producing sulphur. The retorts were filled with ore, and steam under pressure of about 30 lb. was led into them and the melted sulphur drawn off below. According to A. T. Otero, the ore treated ran about 60% sulphur, and the total production amounted to about 200,000 lb., of which 150,000 lb. was sold at Albuquerque, the rest being disposed of in small lots to local purchasers.

Examination led to the conclusion that the quantity of available sulphur in the Jemez Canyon deposits is too small to be of commercial importance, especially in view of their inaccessibility.

*Acting director, U. S. Geological Survey.

The Cloncurry Copper District Of Queensland

By W. H. Corbould*

The township of Cloncurry is 482 miles from Townsville, to which it is connected by a 3 ft. 6 in.-gage railway. The copper belt is approximately 250 miles in length by 40 miles wide. The rock formation is quartzite, altered porphyry, granular felspathic rock, diorite, and granite. The copper lodes exist in all these formations, with the exception of the granite, and also occur as contact lodes.

The district has been known for about 50 years. Among the early pioneers were Ernest Henry, A. Kennedy, and F. Gibson. Henry disposed of a group of mines 30 years or so ago for about £30,000 cash, but the foreign company which operated them stated that the distance from railway communication crippled the undertaking. Kennedy and Henry later sold another mine for £15,000 cash, and Gibson disposed of his mining interest to the same Victoria group. The venture has since become a great financial success.

About 12 years ago two American engineers visited the field and were offered a well-known property for £8000 cash, but they declined the offer. The property has since paid over £400,000 in dividends.

Knowing something of American mines and the system of handling large propositions, this district impresses me on account of its potentialities. Up to the end of February, 1918, it has produced 80,950 tons of copper from ore averaging from 8% to 20%. So far it has been worked as a high-grade field; and unless high-grade copper ore is showing in the outcrop no one attempts to work the lode. When lodes are exploited, work is confined mostly to high-grade ore. Lodes may exist in the granite, as in Butte, Mont., but no one here would attempt to prospect unless the ore was showing at grass roots.

*Consulting engineer, Selwyn, North Queensland.

At no distant date the life of the field will depend on the medium and low-grade ores. Of the three important groups operating in the field two are owned in Melbourne; the other is controlled from London and Paris. Each has its own smelting and converting plant. The treatment capacity of the plants is limited to a certain tonnage of high-grade ore, and mining is confined therefore, in most cases, to the search for this class of material. The tendency is to make a known so-called wall a boundary of the ore channel; and if crosscuts are extended out and encounter low-grade ore, it is considered valueless.

The method outlined compels the conclusion that a treatment proposition laid out for the handling of poor quality ore has a distinct advantage, because, in development work, low-grade material, which may not give a profit, still may yield sufficient return to cut down part of the development costs.

The Mount Elliott group of mines comprises the following:

1. Mount Elliott Mine—The lode at the 400-ft. level is about 250 ft. wide, and contains about 3% copper.

2. Consols Mine—The lode at the 480-ft. level is about 100 ft. wide, carrying about 4% copper.

3. Dobbin—At the 330-ft. level the ore channel is about 50 ft. wide, but work is confined to a width of 5 to 20 ft., with about 7% copper.

4. Great Australia Mine—The dolomite lode at the 300-ft. level is from 15 to 115 ft. wide and assays about 2½% copper. The siliceous lode on the surface is about 60 ft. wide, is being open cut, and shows a content of 4 to 5% copper.

5. Argylla Mine—With the exception of small prospecting shafts, the mine has only had the surface scratched, but from the appearance over a width of 100 ft. the whole of the outcrop could be handled as a low-grade proposition by steam shovels. A cross-cut at the 100-ft. level shows about 24 ft. width of 6% ore, and four feet width of 18% ore.

6. Mount Oxide Mine—At about 270 ft. below the outcrop shows 5 to 20 ft. width of 20% copper, and a large width of low-grade ore. It is estimated that there is approximately 250,000 tons of 10% ore available in the mine.

It is safe to say that the Elliott group has several million tons of 3 to 4% ore that could be made available, given adequate railway communication and a plant to treat a large tonnage of low-grade ore. To give an idea of production costs in the past, I may say that the Mount Elliott mine, on a 11 to 12% ore, produced, up to September, 1913, 17,269 tons of blister copper and delivered this f.o.b. Townsville at a cost of £31 ($147.25) per ton. Since then, however, costs have crept up considerably.

The climatic conditions are good. The three hot months are December, January and February. The altitude of the district is 600 to 1400 ft. above sea level, with an average rainfall of about 20 in. per annum. As to water for treatment works, it is only a question of money to conserve large supplies.

Rates of wages paid in this district, 44 hours per week, with time and a half for overtime, are as follows:

Mining or Smelting Section: From £4 4s. 4d. ($20.20) for a general laborer to £5 9s. 1d. ($26.15) a week for a shift boss. Other occupations in proportion.

Surface and General Section: Blacksmiths, £5 9s. 1d. ($26.15) per week. Engine drivers from £4 12s. 7d. ($22.20) to £5 14s. 7d. ($27.45). Fireman from £4 9s. 1d. ($21.35) to £4 15s. 4d. ($22.85). Mechanics, £5 15s. 6d. ($27.70). As in other parts of the world, all wages are on the increase.

Powdered Coal as a Fuel

The essentials of good combustion are complete oxidation of all combustibles in the coal, to avoid loss in the ash and up the stack; control of both combustion and air; control of flame length; a flexibility in the fuel feed which will permit of variation in heat input; control of the nature of the combustion, and one-stage combustion. These points were emphasized at a meeting of the American Chemical Society by W. G. Wilcox, who urged the use of powdered coal as a means of offsetting the fuel shortage.

Mr. Wilcox stated, in referring to oxidation of all combustibles possible in actual practice, that in tests at a plant using 100 carloads of coal per day and employing fuel containing 5½% sulphur, 34% volatile matter, 40% fixed carbon and 18½% ash, the loss with overfeed stokers was 25% unburned carbon in the ash and 4.6% actual coal; with chain grate stokers, 35% and 6.5%, and with the hand-fired type 35% and over, and 6.5%. These losses are not encountered, it is inferred, in powdered-coal combustion.

Regarding the combustion of coal as a reaction between solid fuel and oxygen, he asserts that the velocity of the reaction and its completeness depend upon the surface exposed by the solid, the pressure of the reacting gas and the intimacy of the mixture. A 1-in. cube of coal, ground to pass 85% through a 200-mesh screen, he estimates, increases the surface of fuel exposed from 6 to 1800 sq.in., or 300 fold. The rate of combustion can be proportionately speeded up and the velocity of combustion doubled with each rise of 10° C., due to greater surface exposure.

The use of the helical screw-feed controller and of variable air pressure for blowing the powdered coal into the combustion chamber are specified as giving the necessary flexibility of control of combustion, which, in the opinion of Mr. Wilcox, makes powdered fuel an ideal combustible.

A Transparent Liquid in Which an Ordinary Stone Will Easily Float can be made by the alternate solution of iodide of mercury and iodide of potassium in water. It is known as Sonsted's solution, after the inventor, and the peculiar phenomenon observable during its manufacture is that, whereas saturation point is reached several times with each particular salt at each phase of the process, the solution is able to take up still more after absorbing the other salt. Potassium iodide is therefore added till saturation point is reached, then mercuric iodide. The solution is then in a position to take up more potassium iodide, and so on. The final weight of the solution may be over three times the weight of a corresponding volume of water. It is expensive to prepare and exceedingly poisonous. The specific gravity may be reduced if necessary by the simple addition of water. Such solutions are used in connection with the preliminary research work on metalliferous ores, which are ground and then shaken up with the solution, whose specific gravity has been adjusted to requirements and is of a density that will permit the heavier minerals to sink, whereas the gangue, or stony portion of the ore, floats or remains suspended to permit of examination.

Correspondence and Discussion

Grinding Ore in Ball Mills

The article by Algernon Del Mar in the *Journal* of July 6 is, I believe, subject to some corrections. It is not my purpose to discuss the merits or demerits of a mill in which I am interested, and the same thing applies to mills of other manufacture mentioned in this article.

The principle of a low pulp line in a tube mill was pointed out in a paper by F. L. Bosqui, in Volume 53 of the A. I. M. E. Mr. Bosqui discussed this subject at considerable length in this article, under the head of "Metallurgical Practice in the Witwatersrand District of South Africa." From this all-sliming cyanide work he showed that "the weight of pebble load would be decreased 25% without affecting the crushing efficiency, with about 10% decrease in power consumption, the mechanical efficiency showing a corresponding increase."

In the development of ball mills I have found that Mr. Bosqui's statements are correct, but instead of using pebbles, as in the South African practice, I have confined my experiments entirely to the use of steel balls.

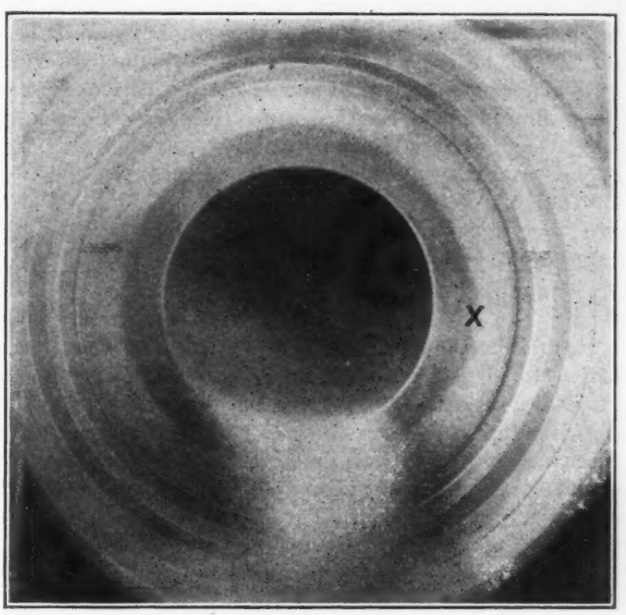
Our mills I have found to be more efficient when short, on all classes of feed, and consequently later developments have been in making the Marcy ball mill shorter than the diameter, as the length of the mill has nothing to do with the fineness of the finished product when operated in closed circuit with a mechanical classifier. The classifier determines the size of the product, but the rapid change of the mill contents is necessary for high efficiency.

In Mr. Del Mar's article he includes my mill in the quick-discharge class, and makes a number of statements and inferences which are not correct. Of the many he makes, I will mention seven.

1. With classified feed, he says there is no advantage in the quick discharge, and it may cut down the capacity. This may be true of such mills as are not properly designed, or not operated correctly; but such conditions are hardly open for discussion. There are a large number of low-pulp-line mills that are operated on fine feed, which are giving big capacity and satisfaction. Careful experiments have been made to determine the difference between the overflow mill and the grate mill. In the grate mill, the relative gravity of the balls is increased, owing to the non-buoyant action of the pulp, and the balls becoming coated with sand, due to the much thicker pulp that can be maintained with the grate mill. The results of our own experiments and others' on both coarse and fine feed have more than confirmed Mr. Bosqui's statement. The conclusions following an elaborate test along these lines will be published soon.

2. Mr. Del Mar states that there is excessive wear on liners and balls. The published statements of large mill plants such as Inspiration, Kennecott, and Arizona Copper Co., when crushing for flotation, show this statement is not a fact.

3. The diagram given, which purports to show the pulp level or flow of pulp, is not correct. I know nothing about and have no quick-discharge devices, but the pulp line that is away from the influence of the balls is nearly a straight line over the entire length of the mill, regardless of whether the mill crushes coarse or fine feed. The discharge of the pulp into the grates takes place along this line and section, but also on the section represented by the ball area against the grates. Large quantities of sand and water are carried up by the balls. The photograph accompanying this article shows my open-end rod mill with practically the entire end open. This mill is filled with rods within 6 in. of the feed-end opening. The discharge of the pulp is as shown, i. e., the rods carry up the pulp, and the discharge is as shown in this photograph, which was taken while the mill was in operation. Open discharge ball mills with



DISCHARGE END, MARCY ROD MILL

grates show the same conditions indicated in this photograph, and the discharge is not as represented by Mr. Del Mar's diagram.

4. Mr. Del Mar states that the liner wear is greater at the discharge end than at the feed end. At Inspiration, where there is being ground 18,000 to 20,000 tons per day in ball mills for flotation, no such wear takes place. The actual abrasion per pound of steel for each ton crushed is practically no more on one end than on the other, when the same material is used for liners.

5. He also states that with fine feed the sands are at the feed end of the mill, and that the balls and liners wore more at the discharge end, because of the fact of there being no pulp at that end. An examination of the inside after stopping shows that the sands are dis-

tributed over the entire length. The loss by abrasion of balls and liners per revolution, if there were no feed or sand in the mill, would be less than if there were rock or sand in the mill. Sand acts as an abrasive—it is like emery—and if any one has actually found that the wear was greater with a long mill at the discharge end, it was due to the finer sand having a greater abrasive action than the coarser sand at the feed end.

6. Pebbles never are used in the Marcy mill.

7. The quotations that Mr. Del Mar makes, and the milling plants cited, do not have mills of my design, as his statements and the mention of my name infer.

Mr. Del Mar in his book has emphatically recommended the overflow type of mill, and his article in the *Journal* of July 6 confirms this recommendation. Mill practice and mill design change, and change quickly. Mills that are of good design today may become obsolete at any time.

The subject of crushing ores is most important, and represents one of the big items of expense in ore dressing. A correct analysis of the means used for crushing is necessary for our advancement. F. E. MARCY.

Salt Lake City, Aug. 16, 1918.

[Rand practice is not "all-sliming." The tube mills are used to regrind the battery tailings, so that the greater proportion of final product is sand, and suitable for leaching. In making any comparison between short-length ball mill operation and the experiments referred to by our correspondent, it should not be overlooked that the mill used in the South African tests was abnormally long, the feed was a comparatively fine sand, and the "pebbles" used were probably rough, unshaped chert.—EDITOR.]

German Influence in Australia Does Not Apply at Broken Hill

I note that in a recent issue of the *Journal*, in an article which is headed "Germany Controlled Australian Mines," Mr. Hughes is reported to have said, in a speech before the Harvard Club: "Our mines, which are extensive, were entirely under the control of German capital. . . . But, to be fair, the German energy and capital were very beneficial to us. After we took over the mines ourselves, we found the plants and organizations so excellent that we were able to begin at once the making of munitions."

I cannot help thinking that Mr. Hughes must have been incorrectly reported, for, as a matter of actual fact, there are no mines—centainly none of the zinc-lead mines at Broken Hill—which were controlled in any way by Germans or by German capital. Among the shareholders of these companies there was never more than a small percentage of Germans. The plants and organizations of which Mr. Hughes speaks as being "so excellent" were solely the creation of British capital and British organization, and I desire to remove any impression to the contrary that may have been created by the statement reported to have been made by Mr. Hughes.

Any German influence was strictly limited to certain contracts for the purchase of the raw material produced, in consequence of the non-existence of British smelteries in which the material could be treated, and refers to almost the whole of the zinc concentrates and a small proportion of the lead concentrates. This, no doubt, helped to build up German control of these metals and their markets; but the reported statement, as it stands, is entirely incorrect, because these mines were not under the control of German capital, nor was their organization or development due in any shape or form to German brains.

ZINC CORPORATION, LIMITED,

London, E. C., July 26, 1918. F. A. Govett, Chairman.

Crisis in Gold Mining as Viewed By a Montana Miner

I agree with the editor of the *Journal* that the crisis is reached and that gold properties will suspend operations one by one, according to the grade of ore, until gold will be produced only as a byproduct. Gold mining is the only business that is operating at a real loss on account of the depreciation of the purchasing power of the product. A remedy for the existing conditions must show itself as soon as the war is over, if not before. We have been loading high prices, high wages, and inflated values on one side of the scales in our mad rush to get increased production, which has greatly overbalanced the gold reserve. It really does not mean a great deal to the producer, as we are simply depreciating the value of the American dollar.

When the war is over the balance must be struck; we must take off from one side of the scales or increase on the other. A world effort to liquidate is out of the question, as it would cause panic and revolution both here and abroad. To increase the gold output under present abnormal conditions is also out of the question; even under pre-war conditions the gold production was on the wane. Only one solution of the problem remains: gold will be at a premium, not 50% in five years after the war, but 100% and even more six months after peace is declared.

The suggestions offered for the relief of the gold miner are inadequate and unjust; the excess-profit tax law must fall on all classes of business alike. Gold mining cannot be classed as a war industry, although it will be of vital importance in the adjustment of conditions after the war. The remitting of freight rates is not tolerable in dealing justice to all. To make employees of gold mines immune from draft is not requested and would be an unpatriotic action.

The gold miner does not want to be placed in the special privilege class, nor does he want his business subsidized; he simply wants justice under the present inflated conditions governed by the law of supply and demand. If our Government and the governments of the rest of the world promise to pay, they must have some world standard to pay with: the re-standardization of gold is an absolute necessity for the world's business; and as England practically controls the gold output of the world, it is up to her to take the first step.

If our Government wishes to do justice to the gold miner at the present time and encourage gold mining, the mints should credit the producer at $40 per oz. instead of $20.67 for all gold produced within our borders during the period of the war.

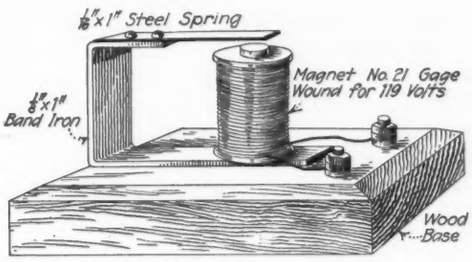
Maiden, Mont., July 25, 1918 E. B. COOLIDGE.

Details of Practical Mining

Anaconda Company's Bell and Buzzer Signal System

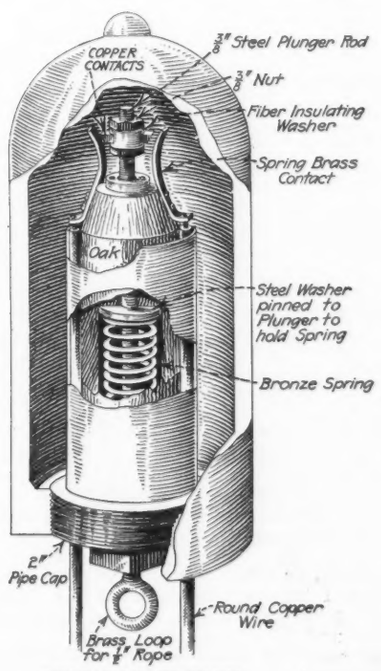
BY R. H. RICHARDS

The buzzer signal system is used at Anaconda, signaling between levels; the buzzers are connected so that if the switch is closed they operate on all levels. The signal for each mine level is governed by state law.



MINE SIGNAL BUZZER

The cage tender answers the person signaling, with one flash; the person signaling back answers with one flash to go to a higher level or two flashes to go to a lower level, and gives no answer if rock or material is to be taken away from the station. The buzzer and switch are placed in a dry position on the station. The

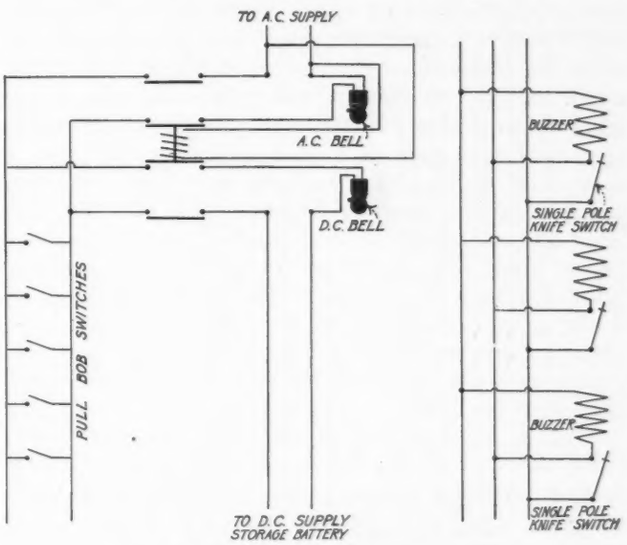


PULL-BOB SWITCH

switch is a single-pole knife switch. Lead cable is used throughout, and brought out to a terminal box at each level.

The bell signal system is used to signal the engineer to operate the mine hoist, and the cage tender is only allowed to give signals. The pull-bob switch is mounted inside the shaft, the switch being operated with a rope about 5 or 6 ft. long at each station. The signal is not given until after the cage doors are closed, the cage tender holding the rope until the cage starts. The pull-bob switch is simple in design but strong in construction. It is mounted on a 2-in. pipe cap and screwed into a heavy cast-iron cylinder mounted in the shaft. This protects the switch from water or falling rock. The switches at the stations require about 17 lb. pressure to operate.

In addition to the station switches, pull-bob switches are placed every 200 ft. in the shaft and are operated



WIRING DIAGRAM OF SIGNAL SYSTEMS
Left, Bell. Right, Buzzer

with the same length of ½-in. rope. These switches have a stronger spring and require 50 lb. pressure. All bells and buzzers operate on 110-volt, alternating current. The bell system has an automatic auxiliary connection to a direct-current storage battery. The alternating-current coil holds contacts to alternating-current mains, so that if current is cut off the contacts close by gravity. This requires a separate direct-current bell. The state law also requires a hand-operated bell rope the full length of the shaft.

Drawings showing the construction of switches and buzzers, all of which are made in the Anaconda Copper Mining Co.'s electric shops, are shown herewith. A wiring diagram is also given.

Converting Scrap Into a Sinking Hoist

When the Hecla Mining Co. decided in the spring of 1917 to sink its shaft 500 ft. deeper, difficulty was found in getting delivery upon a large enough 2200-volt electric hoist having the requisite speed. It was deemed necessary to have a hoisting speed of 1000 ft. per minute, as the shaft at the time was sumped 100 ft. below the

1600-ft. level; and it was desired to conduct sinking operations from the 1200-ft. station, which would mean hoisting from a depth of 1000 ft. below the 1200-ft. level by the time the shaft was again bottomed.

Rather than take a slower hoist, the master mechanic, J. B. Sloan, after looking around the camp, decided to build a sinking hoist at the shop. An old motor, controller and connecting coupling from a worn-out electric pump were in the shop, and he could get, at scrap price, a second-motion steam hoist, one of the oldest in the district and no longer used, that had served the Tiger shaft, near by. The motor was rated at only 75 hp., and the starting load would require about 150 hp. As Mr. Sloan could not get a new 150-hp. motor, it was decided to use the old one, as it was in fair condition, and not being rated as closely to capacity as are the motors of today, and not having to hoist continuously throughout the day, he believed that it would stand the initial short overload.

The Tiger hoist was a 40-in. double-drum second-motion steam hoisting engine, with an old-fashioned horizontally traveling indicator. Mr. Sloan had to cut down the frame to carry only one drum, and to rig up a new indicator of the dial type. This was done at the mine machine shop, which possesses only the ordinary equipment of a shop at a mine producing 1000 tons a day. The motor and the drum, with their separate bases, were then mounted properly on a concrete base block on the 1200-ft. station. Using the original gears on the hoist, and connecting the motor to the driving pinion through the flexible mine-pump coupling, and fitting an extra foot brake to the hoist by putting a band brake around the collar of the coupling, the hoist was connected to the old street-car type of controller which came with the pump.

Trouble was experienced until the hoistmen understood the way to get up speed under such an overload; but after a few days they had learned the hoist and easily worked it up to a speed of 1000 ft. per minute within a reasonable distance. The shaft was sunk with this scrap hoist without trouble, and the company is not only ahead by a good part of the first cost of a new hoist, but it was also able to sink the shaft without delay. A good master mechanic can save a mining company many dollars and much time if he be imaginative and ingenious.

Electric Buzzer for Raises

BY C. T. RICE

When a raise reaches any great distance above the level, there is difficulty in signaling. The men can rap on an air pipe, but that is unsatisfactory, and often the signal is misunderstood. At the Hecla mine, Burke, Idaho, where the raises driven through from level to level are of at least 300 ft., electric buzzers are installed for signaling. A similar system is also used where hoisting of timber is frequent, for the noise of the hoist makes pipe signaling uncertain and unsatisfactory. Included in the buzzer box is an electric lamp that flashes simultaneously with the signaling of the buzzer, so that the hoistman can perceive the signal in case the hoist is running and he fails to hear the buzzer.

The system is housed in a gable-roofed sheet-iron box, which is closed in front but open at the back and bottom, that the wiring may be easily accessible, although the apparatus is protected from drip in wet places. This housing is screwed to a three-inch board on a post near the hoist, insulators being used around the lag screws, so that, should insulation on the wires break down, no one will get a shock from the post.

The electrical equipment consists of a 4-in. Benjamin mine buzzer, an Edison plug cut-out, a porcelain wall socket and four porcelain bushings for insulating the wires where they pass through the box. The buzzer is bolted to the front of the box under the projecting roof, and a sounding board effect is thus obtained and the loudness of the signal is increased. The plug cut-out and the wall socket are screwed to a ½-in. board inside the box. This board is fastened to the side of the box, but is placed a quarter of an inch from the front, as otherwise it would vitiate the effectiveness of the front of the box as a sounding board. Sleeves are soldered to the box for carrying the porcelain bushings, and there is a small iron strap across the bottom to strengthen the sides. All parts, with the exception of the electrical equipment, are coated with asphalt paint to protect the box from the water, and a 40-watt lamp is placed in the lamp socket.

In the raise the miners use an ordinary electric push button for signaling. Insulated wires extend up the manway on insulators placed in a wooden box made by nailing two 1 x 1½-in. strips to a 4 x 1½-in. piece as a bottom, which protects the wires. Little trouble is experienced from injury to the wires, and the convenience of the signaling greatly expedites the landing of timbers and other material in the raise.

Don'ts for Pump Runners

The following "don'ts" for pump runners appeared in *Coal Age* and may be found useful, as they seem to cover all ordinary operating points:

Do not run a pump without water.

The numerous bushings and sealing rings on the inside of a pump depend on water for lubrication, and if the pump is run without being first filled with water these parts will get hot and "freeze," doing great damage to the pump.

Do not run without oil in all the bearings.

Do not run with dirty oil in the bearings.

Do not let water get into the bearings.

Before starting up, see that the bearings are full of clean engine oil and that there is no water in the boxes. This can be done by loosening the drain plug on the bottom of the box to see if clean oil comes out and by measuring the depth of oil in the box. Do not rely altogether on the oil-level gage, as this sometimes gets choked up. To keep the bearings clean, drain all oil out of the boxes once a week and thoroughly wash out with two or three bucketfuls of water. The old oil should be filtered and used over again if it is not too gummy.

Do not run the stuffing-box glands tight.

This produces unnecessary friction, causing the boxes to heat up and the packing to burn out. Having the glands loose and allowing them to leak a little keeps the packing lubricated and the stuffing-boxes cool.

Do not run with leaky joints around pump.

This is unnecessary, and if not stopped in time will ruin the joint faces.

Do not allow water to collect around the motor.

Do not run a pump or motor that vibrates excessively.

This is caused by the machines not being in balance or line. It should be reported at once.

Do not run unless you are satisfied that all parts are in good condition.

Do not allow oil, grease or dirt to accumulate anywhere in the pumproom.

Events and Economics of the War

Under constant pressure from the Allied forces, the Germans are continuing their retreat toward their positions held last March, where it is expected they will endeavor to stand; Roye and Noyon have fallen to the French and Bapaume and Péronne to the British; the latter also broke through the Queant-Drocourt line on a six-mile front to a depth of four miles. In Siberia, an attempt by General Horvath to assume control of all Russian forces there was frustrated by the Allies and speedily collapsed. The Bolshevik leader, Lenine, is reported to have been shot in Moscow on Aug. 30 by a revolutionist.

At Washington, the Man-Power Bill was signed on Aug. 31, and Sept. 12 was set by the President for the registration of men affected by the new law. Motorists throughout the country have been called upon by the Fuel Administration voluntarily to stop the unnecessary consumption of gasoline on Sundays. I. W. W. leaders recently found guilty of attempting to frustrate the country's war program were sentenced in Chicago on Aug. 30 by Judge Landis, the leaders each receiving 20 years in prison and a $20,000 fine. On the same day, the Director of the Mint ordered the U. S. Assay Office in New York to discontinue the sale of gold for commercial purposes; this was later revoked.

How Will the New Draft Ages Affect Industry?

Probably before this item is published the new draft law will have been passed and signed by the President. Under it all men between the ages of 18 and 45 not now in military service will be subject to call. The selective principle is retained, but the law itself says nothing about classes to be exempted.

The prospective passage of the law has stirred industry as has nothing since the war began. How will the selective principle be applied? Evidently the line will be drawn tighter than ever between the essential and non-essential industry. In other words, the "work-or-fight" principle will apply, but in the essential industries themselves what effort will the Government make to protect itself by retaining in the industries the men who are carrying the burdens of those industries—who furnish the executive brains, the energy and the enthusiasm? A great many of these men are between 35 and 45. At the same time, their abilities have enabled them to accumulate enough to have sufficient independent income if they have no dependents. Needless to say, withdrawal of these men would be a calamity. It is hard now to keep the industries going; nothing less than stoppage would result if the mainsprings, the active managers, were taken. With the decline of these industries would go not only the destruction of our industrial war program but also the net income of these companies and the consequent ability to pay taxes and buy Liberty bonds.

Certain it is that our industrial structure, under the easiest conditions, must suffer a very considerable alteration. This is to be expected. But the country would be the better off if business men can be informed quickly of the Government's policy. Certainty should succeed uncertainty as quickly as possible. Only so can preparations be made for taking care of our industrial enterprises. The time for adjustment is all too short in any event.

A general policy should be declared. If interpretation is left to the local draft boards, the results to the industries and the Government may be serious. So far the Government has applied the selective draft principle intelligently. The confidence created in the Government and in the Secretary of War should be retained by a frank declaration from the Secretary to the business men of the country at once.

Miners Urged To Seek Deferred Class

Realizing the danger of further depletion in man power in mines and oil fields from the new draft law, the American Mining Congress has interviewed General Crowder and Chairman Neave of the Man-Power Committee of the U. S. Employment Service, in whose hands is placed jurisdiction over problems involved in the new draft. The Provost Marshall General is determined to place all physically capable men from 19 to 36 into military service at once, except those shown to be absolutely necessary to production in the industries. It is essential that the operators assist in placing valuable men in deferred classes.

The U. S. Employment Service, through Felix Frankfurter, chairman of the War Labor Policies Board of the Labor Department, plans a campaign, backed by a declaration of President Wilson, to urge all men engaged in necessary work in mines, oil fields, and industries producing raw or manufactured materials to ask for deferred classification. A special committee to handle "man-power" problems has been named, with Charles Neave, a New York attorney, chairman.

Aluminum Production Increase Insured By Canadian Coöperation

A gratifying example of the coöperation between Canada and the United States in the matter of mutual stimulation of war industries is afforded by an incident which occurred at a recent sitting of the international commission on boundary waterways, held at Atlantic City. The Canadian attorneys, in support of national interests, had blocked action for a suspension of regulations which would have permitted the American Aluminum Co. to build an ice barrier on the south branch of the St. Lawrence River at Massena, N. Y., insuring work throughout the winter, and resulting in the addition of 6,000,000 lb. of aluminum to its normal output. On being advised of the shortage of aluminum for the manufacture of American battle planes, the Can-

adian government's special counsel immediately waived all objections, adding that the plans of the two countries for winning the war were interdependent and identical, and that Canada would coöperate in every way possible to insure the earliest and most complete success to the plans of the U. S. War Department.

Ryan and Crowell Promoted

John D. Ryan has been appointed Second Assistant Secretary of War in place of Edward R. Stettinius, who is now in France, it was announced on Aug. 27. Mr. Ryan, who has been directing the production of aircraft for the Army since the last of April, is now designated director of air service and is charged "with the responsibility of procuring and furnishing to the Army in the field the material and personnel required for the air service, and is given supervision, control, and direction over the Bureau of Aircraft Production and the Bureau of Military Aëronautics, with full power completely to coördinate their activities and to develop and carry out the air program." He will select a new head for the Bureau of Aircraft Production.

Benedict C. Crowell, First Assistant Secretary of War, has been specially entrusted with the responsibility for the munitions program, and as director of munitions has been given the necessary power to see that the munitions required for military operations are procured and furnished to the Army in the field.

Shaping New Preference List

The new list of preferred industries that is being formulated by the War Industries Board will be about twice as long as the one issued last April, which contained about 32 classes. The amplification is due to the widely expanded war needs and to allow for pressing demands of civilian origin.

The preference list is a key to the relative importance of all of the country's manifold industrial enterprises. The values are established by surveys as to national needs, and, once established, the list is maintained by a system of priority in determining the use of the six basic elements of industry, which are, (1) material; (2) facilities; (3) fuel; (4) transportation; (5) labor, and (6) capital. A point of interest lies in the fact that in the preference list is to be found an indication of what constitutes war work.

German Ore Imports After the War

No shortage of iron after the war is feared by German ore importers, according to an article in *Iron and Coal Trades Review*, and the German government has no intention of controlling this branch. Polish ores promise little in view of past experience. The Ukraine, on the other hand, may be relied on to yield valuable iron ores, especially for the Upper Silesian blast furnaces, provided that normal conditions are restored in transport. As for Swedish iron ores, much will depend on whether the Swedish government succeeds in its efforts to attract sufficient capital for smelting in Sweden itself. Moreover, it must not be overlooked that the favorable trade balance of Sweden rests largely on the export of iron ore. Even if there is no intention of regulating the import of iron ore in the transition period, the tonnage situation will have no small influence on the solution of the whole problem of ore imports.

The only state import organization which has come into being is for pyrite, of which German industry requires considerable quantities. As regards copper ores, Germany, of course, needed these in the first instance, and she has been deprived of the copper ore of the countries where she satisfied her requirements before the war. The various companies which are now completely under British influence have made mutual agreements for years to come, so that there is little chance of Germany obtaining the ores directly. Her principal sources of supply will now have to be Turkey and the Caucasus, but these deposits are little developed, and German companies will have many difficulties to overcome in Turkey, where the inhabitants are anything but friendly.

The German government has not sanctioned the foundation of a special copper-importing company, for experience has shown that after the war untrammeled trade will be in a better position than the government to obtain in the world market the copper required by German industry. The same authority also holds that Germany can no longer count on the lead and zinc ores which before the war were imported by a ring of German firms from Australia, and made up 90% of the total imports of these metals. In this case also Turkey may be helpful.

Manganese Prices in California

The War Industries Board has received an appeal from the Chamber of Commerce of San Francisco, representing the manganese producers of California, protesting against the prices recently fixed on agreement between the board and the American Iron and Steel Institute. It was later ascertained, with regard to manganese ore produced, sold, and consumed in the State of California, that the official schedule of prices could be disregarded. This phase of the question is therefore settled, and local conditions will remain undisturbed.

The following freight rates on manganese ore were authorized on Aug. 17 by Director General McAdoo:

RATES ON MANGANESE ORE, CAR LOTS, TON OF 2000 LB. MINIMUM CARLOAD WEIGHT, 60,000 LB.

From Stations in—	Group D(a)	Group 2(b)	Group B and C(c)	Group A(d)
Oregon	$11.00	$12.50	$12.50	$15.50
Washington	11.00	12.50	12.50	13.50
California	11 00	12.00	12.50	13 50
Montana	8.00	9.50	9.50	10.50
Arizona	9.00	9.00	10.50	11.50
Colorado	7.00	7.00	8.50	9.50
Nevada	10.00	11.00	11.50	12.50
Utah	9.00	10.00	10.50	11.50
New Mexico	7.00	7.00	8.50	9.50

a Group D: Chicago, Indiana Harbor, and Erie.
b Group 2: Points in Alabama and Tennessee taking Group C rates.
c Group B and C: Youngstown, Pittsburgh, Buffalo, and points in Ohio.
d Group A: Points in Seaboard territory, including Goshen, Va., Graham Va., Reusens, Va., and Roanoke, Va.

These rates are much lower than those prevailing in current tariffs and will tend to place Eastern and Western producers on a basis more nearly equal.

The American Tin Plate Co., a subsidiary of the United States Steel Corporation, will add 24 tin mills to its plant at Gary, Ind., according to a recent announcement. The extension, which will cost about $10,000,000, is made necessary by the extraordinary demand.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Application of Fixed Prices Defined

For the purpose of additional clearness and to prevent constant repetition, the price-fixing committee of the War Industries Board has adopted a resolution to the effect that where prices are stated to be fixed for the U. S. Government, the governments associated with it in this war, and the public (or primary civilian sales), the said prices are to extend to the Government and civilians of the United States (including civilians of its territories and insular possessions) and to the governments of Great Britain, France, Italy, Belgium and Japan. Furthermore, these maximum prices are not to extend to purchases made by the civilians of the latter mentioned Allied nations nor to the governments or civilians of nations other than those above enumerated.

Henderson Redrafts War-Minerals Bill

By a unanimous vote the Senate Committee on Mines and Mining accepted Senator Henderson's draft of the War Minerals Bill last week. The bill was formally reported to the Senate on Sept. 2, accompanied by a report written by Senator Henderson, who is chairman of the committee. The bill, as drawn by Senator Henderson, has the approval of the President, of the Secretary of the Interior and of the chairman of the War Industries Board.

As the discussion of the bill took up all of the time of the committee, the matter of gold production was not considered. Senator Henderson expects to call the committee together next week for a conference on that subject.

There will be no discussion of the subject of gold production by the Committee on Mines and Mining of the House until the results of the investigation of the Jennings committee are available.

May Ask Money for Potash Research

With the need for potash becoming greater, an effort will be made at this session of Congress to obtain an appropriation providing for experiments looking to the recovery of potash as a byproduct from blast furnaces and cement plants and to the investigation of potash-bearing silicate rocks.

The domestic production of potash during 1918 is estimated by the U. S. Geological Survey as 60,000 tons. This is 25% of pre-war importations. Some progress in its recovery is being made by cement companies. At the end of 1918 twelve of them will be recovering potash as a byproduct.

Blast-furnace operators are not inclined to undertake the recovery of potash in the face of pending revenue legislation. If they were allowed to amortize the cost of the potash equipment before being subject to a profits tax, it is believed that interest in the matter would be stimulated. This certainly would be the case, it is declared, if anti-dumping legislation were enacted.

All Steel for War Purposes

Any non-war use of steel is out of the question. A statement to this effect comes from Bernard Baruch, chairman of the War Industries Board, after the thorough survey of industries which has been made in connection with the adoption of the 64 groups of prime essential industries. Mr. Baruch also is making a determined drive on the high cost of living. He has begun with the shoe manufacturers. It is understood that those manufacturers have agreed to the standardization of their output in a limited number of fashions and that they have agreed to a price-fixing program.

Standardization and price-fixing may be expected to follow in numerous industries, as it is believed to be Mr. Baruch's intention to take active steps to reduce living costs or at least limit any further advances of materials that are essential for the use of the civilian population.

Chilean Nitrate in Demand

The War Industries Board and the War Department have notified the Department of Agriculture that the demand for Chilean nitrate in the manufacture of munitions will exceed the supply arranged for, and that farmers will in future probably have to do without nitrate as a fertilizer.

Suspension of work on the hydro-electric plant being built on the Tennessee River in no way affects the production of nitrates at Muscle Shoals, the Ordnance Department announces. As five years will be required to complete the large power plant, it must wait so as to release labor and materials for more urgent work. The Muscle Shoals plants are being rushed to completion. Over 20,000 men are now employed there. Prior to the completion of the large waterpower plant, power will be purchased from the Alabama Power Co. and will also be generated at a Government steam electric plant for operating the new project.

Gold Producers Slow in Replying

It is Senator Henderson's intention to call a meeting of the Committee on Mines and Mining this week to discuss the gold situation. The committee in each house is being flooded with requests that action be taken and with suggestions as to how the situation may be remedied.

While a study of the question will be started immediately, it is probable that the committees will await the results of the investigation now being made by a committee headed by Hennen Jennings. This body, however, is being retarded in its efforts by the failure of gold producers to reply to a questionnaire sent them recently. Before intelligent action can be taken, Mr. Jennings believes that it is absolutely necessary to have at hand certain late data which can be furnished only by the producers themselves.

Cousin Jack Speaks for the 27th

I 'as 'eld up my h 'own on a muck-stick,
An' I naws 'ow to crib up a raise;
An' all other phases of minin'
I've done well, for I naw that it pays.

In 'andlin' a jack or a burley,
Or in cuttin' a post for a set,
You'll find that I naws all about it,
For 'twas minin' come first, you can bet.

Then the war, with its fright and its 'orrors
Come along. An' they sent out their call
For miners. There's no doubt about it
They was needed—we h 'answered—that's all.

Hard work ahead for the mining regiment. Dig from sunup until sundown and then some. Harder than the work they left at the call to the colors, as Cousin Jack describes above. While they are digging down, let us follow suit, with the Comfort Fund in mind all the time. Send in your check today.

HOW THE COMFORT FUND STANDS

Prevously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
Total	$16,342.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Memory of Dr. Douglas Honored

Owing to the late arrival at Colorado Springs on Sept. 3 of the members of the American Institute of Mining Engineers, the memorial service for Dr. James Douglas, which was on the program for the forenoon, was postponed until 2 o'clock. President Sidney J. Jennings opened the service with a brief review of Dr. Douglas' openhandedness toward the Institute, and was followed by E. P. Mathewson, representing the Canadian Mining Institute, who told of the generosity of the late philanthropist in matters affecting Canadian scientific work. Dr. Douglas was portrayed as the publisher and farsighted champion of free interchange of technical information by W. R. Ingalls. T. H. O'Brien, in behalf of the Phelps Dodge Corporation, then sketched the career of the company's late president as a captain of industry, laying stress upon the kindness of Dr. Douglas to his fellow-workers, high and low.

The memorial service was followed by motion pictures loaned by the Canadian government, depicting various methods used in preparing crippled soldiers for industrial usefulness. Other pictures showed the mining and milling operations of the New Cornelia Copper Co., at Ajo, Ariz. Dr. Louis D. Ricketts, who had loaned the films, explained the different features of the work.

Cleveland-Cliffs Iron Co. Holds Annual First-Aid Contest

The sixth annual first-aid contest of the Cleveland-Cliffs Iron Co. was held at Ishpeming, Mich., on Aug. 14, and was participated in by nine teams, one each from the Holmes, Negaunee-Athens, Gwinn-Francis, Lake-Salisbury, Morris-Lloyd, Republic, Gardner-Mackinaw, Maas and Cliffs Shaft mines. The Lake-Salisbury team, composed of W. Jenkins (captain), A. Nault, T. Paul, F. J. Chynoweth, and J. Coad, won first honors, with a score of 98 points. The Republic team was given second place and the Holmes and Cliffs Shaft tied for third place.

The judges were Drs. V. H. Vandevender, G. G. Burnett and H. B. Hayes. The problems were as follows: One-man event—treat a wound of the index finger of the right hand. Three-men event—treat a compound fracture of left forearm and a left ear torn off. Team event—treat a compound fracture in the right thigh and a lacerated wound of the forehead. Team event—a man is found unconscious from gas in face of drift; rescue, using one-man carry, and treat (Schaffer method).

Manganese in Newfoundland

Any important increase in the production of manganese ore in Newfoundland is unlikely, owing to the thinness of the higher-grade beds, the amount of barren material to be moved and to shipping and labor conditions, in the opinion of Frank H. Probert, who has just returned from Newfoundland and Nova Scotia. Mr. Probert is a mining engineer assisting in the war-minerals investigation being conducted by the U. S. Bureau of Mines. He speaks favorably of the manganese deposits in Lunenberg County, Nova Scotia, as a potential source of small quantities of high-grade chemical ore.

August Mining Dividends

Dividends disbursed in August, 1918, by 21 United States mining and metallurgical companies making public reports amounted to $10,320,109, compared with $13,456,756, distributed by 34 companies in August, 1917. Canadian, Mexican and South American companies paid $2,989,637, as compared with $1,771,051 a year ago, the increase being due to the large disbursement by Cerro de Pasco, which paid in August this year, whereas last year its quarterly dividend came in September.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm., pfd	U. S.	$1.50	$120,810
Anaconda, c.s.z	Mont.	2.00	4,662,500
Arizona Cop	Ariz.	.36	554,000
Barnes King, c.g	Mont.	.10	40,000
Caledonia, l.s	Ida.	.03	78,150
Champion, c	Mich.	6.40	640,000
Chief Cons., l.s	Utah	.12½	110,527
Cresson Cons., g	Colo.	.10	122,000
First Nat., c	Calif.	.15	90,000
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	.50	125,580
Internat. Nickel, pfd	U. S.-Can.	1.50	133,689
Iron Cap, c	Ariz.	.25	36,203
Jim Butler, g	Nev.	.07	120,261
Miami, c	Ariz.	1.00	747,114
Mohawk, c	Mich.	2.00	200,000
New Jersey Zinc	U. S.	4.00	1,400,000
Tamarack & Custer, l.s	Ida.	.06	106,575
United Eastern, g	Ariz.	.05	68,150
United Verde Ex., c	Ariz.	.75	787,500
Utah Apex, c	Utah	.25	132,050

Canadian, Mexican and South American Companies	Situation	Per Share	Total
Amparo, g	Mex.	$0.05	$100,000
Asbestos Corpn., pfd	Que.	1.25	50,000
Cerro de Pasco, c	So. Am.	1.25	1,009,474
Coniagas, s	Ont.	.12½	100,000
Esperanza, g.s	Mex.	.24	109,200
Granby Cons., c	B. C.	2.50	374,963
Greene Cananea, c	Mex.	2.00	1,000,000
Hollinger, g	Ont.	.05	246,000

Holding Companies	Situation	Per Share	Tota
Calif. Explor	Calif.	$0.12	$28,139
St. Mary's Min. Land	Mich.	2.00	320,000
White Knob Cop., pfd	Calif.	.05	10,000

The totals for the first eight months of the year are as follows: Mining and metallurgical companies, $105,975,152; holding companies, $1,435,005; Canadian, Mexican, Central and South American mines, $12,745,090. The table shows details of the month's payments.

The Colorado Meeting of the A.I.M.E.

DENVER CORRESPONDENCE

More than 350 members of the American Institute of Mining Engineers registered at the Brown Palace Hotel, Denver, on Sunday, Sept. 1, and over 500 members are expected to attend at Colorado Springs. On Sunday afternoon the party visited the City Park Museum at Denver, where the great collection of native gold is exhibited, and later, by courtesy of Mayor Mills, attended an organ recital at the Denver Auditorium. On Sunday evening, the members attended a band concert at City Park. The first technical session on metallurgy was held at the Brown Palace Hotel on Monday morning, when several papers were read by title and discussed briefly. The subject of electrolytic precipitation appears to have awakened intense interest and will be discussed fully at a later special session. Later the party visited ferro-alloy plants and witnessed the manufacture of ferro-manganese and ferrochrome. At a luncheon, which was held at the Denver Club instead of at Hosea Lodge, more than 200 guests enjoyed the club's hospitality. After luncheon members of the party took an automobile trip to Lookout Mountain, Colorado Point and Gennessee Mountain, followed by a visit to the Herold pottery plant, at Golden. Monday evening 400 members attended a dinner at the Denver County Club, where local members entertained the guests with music and the usual Western freedom and good fellowship. Colonel Burbridge presided. Interesting and entertaining speeches were made by Mrs. Stearns, who reviewed the work of the local branch of the Woman's Auxiliary of the A. I. M. E., and by E. P. Mathewson, H. Foster Bain, C. W. Goodale, Thomas B. Stearns and H. V. Winchell. The party entrained for Colorado Springs Tuesday morning.

Metallurgical Board Created

In order to assure more complete coördination of the various activities of the Ordnance Department along metallurgical lines, it has been decided to establish a board on metallurgical matters, the personnel of which is as follows: Dr. G. W. Sargent, Engineering Division, chairman; Lieut. Col. W. P. Barba, Production Division; Major A. E. White, Inspection Division, representing the Ordnance Department; Lieut. Col. F. B. Richards, of the office of the Assistant Secretary of War; L. L. Summers, representing the War Industries Board; and William H. Smith, representing manufacturers.

Gasoline Conservation Urged

The urgent need of conservation of gasoline, to prevent the necessity of putting the nation on oil rations, has led to the following suggestions from the bureau of oil conservation of the U. S. Fuel Administration:

Leaks and spilling must be eliminated, and evaporation by leaving tanks and cans open must be stopped.

Motorists must not use gasoline for washing their cars, clothes, or hands; they must cease racing their motors, and must stop their engines when cars are not in motion, such as when waiting at railroad crossings and on similar occasions.

Truck operators will be required to conserve gasoline by the adoption of every means that will increase their mileage.

The oil drained from crank cases, differential and transmission, possesses commercial value and must not be thrown away. Even the residual oil used in cleaning must be saved for reclaiming.

Carburetors should be adjusted to operate on the thinnest possible mixture. Cut-off cocks should be installed in the gasoline line next to the carburetor, with control on the cowl of the car, so that the supply of gasoline may be entirely shut off when coasting. The saving such a device will effect will be great and soon would more than offset the cost of making such an addition to the car.

Tungsten Production in China

Mining has become a more important industry as a result of the discovery of wolfram about Swabue during the summer of 1917, according to a consular report. Since then wolfram ore has been found in other parts of the district, and now many thousands of Chinese are digging for this valuable mineral, which undoubtedly exists in large quantities. Much of the output has been sent to Canton, via Waichow, for export, but its free movement is now being interfered with by recently established official restrictions. The people of this region are beginning to display an interest in their mineral resources, and it is hoped that the development of other valuable deposits which are known to exist in this region will result.

Editorials

The Treasury on Profiteering

NOT long ago the Secretary of the Treasury, and through him the President, intimated that they had in the income-tax returns for 1917 evidences of profiteering by corporations and others. This led the Senate, in its resolution No. 253, to call upon the Secretary to submit to it a list of the corporations which in 1917 earned in excess of 15% upon their capital stock. The Secretary responded to this with a bulky report, which is printed as Senate Document No. 259. It is clear from the letter of transmittal that the Secretary did not comply exactly with the Senate's request. The Senate asked for a list of *all* corporations earning in excess of 15%, while the Secretary submitted a list of 31,500 out of a total of 55,000. This leaves us in doubt as to whether the Secretary intended to select a list of "horrible examples" or what he intended to do.

However, the printed report served the purpose of confirming the previous statements and convincing the thoughtless that there had indeed been unconscionable profiteering. Few senators, and much less will Tom, Dick and Harry, either have the knowledge or the inclination to examine critically this mass of figures. They will be more apt to say simply that here is proof positive that there are corporations that earned more than 100% on their capital in 1917, and therefore they should be taxed more heavily. Incidentally, we may remark that we have been informed from Washington that this report is very hard to get. We shall confine our comments upon its figures to those which pertain to the mining and metallurgical industry.

We find first, on p. 129, that under the caption of concerns "smelting and refining copper, lead, zinc, etc.," there are 18 listed. One of these had a capital stock of $3,100,000 and an invested capital of $3,525,262; another had a capital stock of $686,800 and an invested capital of $3,467,256; a third had a capital stock of $1,500,000 and an invested capital of $2,224,428; and a fourth had a capital stock of $150,000 and an invested capital of $1,394,779. These were all of the 18 that were in the million-dollar class, considering both capital stock and invested capital. The rest ranged down to concerns of the $4000 size, there being three whose invested capital was less than $10,213. And this is the presentation of our great metallurgical industry! It looks as if the Treasury experts had been simply summarizing the returns of the junk smelters.

However, on p. 372 we find two more concerns listed under this caption. One of them had a capital stock of $2,500,000 and an invested capital of $4,068,371, on which it earned 26.33%. The other had a capital stock of $50,747,200, on which it earned 26.99%. These two concerns are of fair size, one of them indeed large, but they are very far from representing the metallurgical industry of the country.

Under "mining, copper—Michigan," three large concerns are listed. Under "copper—Montana (Butte)," there is given one concern of $100,000, on which it earned 198.49%. Under "copper—Utah, Arizona, New Mexico," there is one concern given, it having a capital stock of $525,000 and an invested capital of $4,669,662. Manifestly, this is not Utah, Chino, Ray, Miami, Inspiration or Copper Queen. Under "copper—miscellaneous localities," is given one company, possessing a capital stock of $9,997,285, on which it earned 53.92%. We did not need to retain Sherlock Holmes to detect for us that this is Nevada Consolidated. And, knowing that, we are aware that while Nevada was originally capitalized at $10,000,000, increase in the value of the mine long before 1914 had caused its shares to have an aggregate market value of $40,000,000. Investors who purchased those shares around $20, and who did not enter upon any reckless speculation in so doing, will not easily be convinced that they are profiteers owing to their company earning about 13½% on their purchase price.

Among gold, silver, lead and zinc mines there was one that earned the scandalous profit of 468.29% on its capital stock, but the latter was only $60,000. This was the only concern in this list. Its percentage of earnings was, however, paltry in comparison with that of the solitary representative of "mining: gold, silver, lead, zinc, etc., complex ores—Western," which earned 551.13% on its capital stock, but, alas! the latter was only $3000. We thought this was going some, until we turned to the next page and found a caption of "mining: lead and zinc," under which were listed six companies, one possessing a capital stock of $35,000,000, on which it earned 71.6%, but among the five other companies there was one that earned 2573%; one that earned 4087%; and one that earned 4741%. Verily, those are the right kinds of mines for anybody to have his money in, even if their capital stocks were only $8000, $8000 and $5000 respectively!

We hesitate to draw any sweeping conclusions, for, as we have said previously, we do not know whether the Treasury experts selected out of the 55,000 corporations what they deemed to be the most horrible examples, or what reason they had for not reporting the figures of 23,500 corporations; or, in short, what they were up to, anyhow. But the following things we may say with certainty, viz.:

1. They did not obey the Senate's instruction to report *all* corporations earning more than 15% on their capital stock in 1917.

2. They violated the terms of the income-tax law, which provide for secrecy of individual returns. For although they do not state names, but merely give symbols for the several companies, we found no difficulty in identifying the mining and metallurgical companies of importance.

3. If, as Secretary McAdoo says, the 31,500 corporations out of a total of 55,000 "are believed to be representative . . . of the business activities of the country," the conspicuous absence of the principal mining and metallurgical companies (with only a trifling number of them being recorded "present") may be taken as evidence that their earnings in 1917 were on the whole less than 15% on their capital stock.

But what a picayune business it was to list a few $5000, $10,000 and $100,000 concerns in our great industry! To exemplify copper mining at Butte by one concern of $100,000 capital and to list an aggregate of only six copper mines in the entire country! It is more than a picayune business—it is dishonest, for there is a manifest intention to create a false impression. We do not attribute any motive so mean to Mr. McAdoo, for we know very well that he is a man of multifarious responsibilities who is obliged to rely upon what his subordinates tell him. But if the whole of their summary of the income-tax returns of 1917 prepared for the honorable senators is as misleading as the figures for the mining and metallurgical industry, we can only say that the Treasury subordinates who did this work performed a job for which we should not think their superiors would thank them.

The Economics of Salt

THE catholicity of mining engineering is illustrated by the broad scope of the work; and no better example of this could be presented than the article on salt mining and dressing which we print in another part of this issue. The ubiquity of salt and its cheapness in almost all parts of the world often tend to mask the importance of the industry and the problems encountered. Shortages of salt are practically unknown, especially in the United States; and so one reason for the frequent focusing of public attention is absent. Refrigerating plants obtain their normal or abnormal supplies without trouble. The chemical industries are well cared for, even when enormous increases of sodium salts and poison gas are needed to meet the demands of the war. The extensions to equipment which resulted in an excess production a few years ago are now a valuable asset. The mine and dressing plant described in the article referred to will produce about 2000 tons of salt a day, and this will bring New York State into the front rank of salt producers in America.

Salt has figured largely in the economic history of the world. Its scarcity in olden times led to wars and diplomacy to gain possession of saline tracts. Many of the notable trade routes originated for the better distribution of salt and incense—two commodities typical of material and spiritual awakening in early times—a juxtaposition which doubtless led to the use of salt in connection with many quaint and superstitious customs. The scarcity of salt can be gaged from the fact that in parts of northern Africa it has been used as currency. Tribes and races have lived in other parts of the world without becoming acquainted with it; with the result that there is a greater craving when it is once introduced than more civilized races have for sugar. A cannibal appreciates the attractiveness of a naturally seasoned portion of missionary—a circumstance that may partly explain the frequent disasters to white people in unfrequented and unexplored places. It would, perhaps, be far fetched to attribute the elimination of cannibalism or other savage instincts entirely to salt, but there is abundant evidence to show that its introduction and extended use have been a concomitant of civilization and progress.

The uses of salt are legion, and its culinary application is, perhaps, of least importance. As a necessity it is indispensable in the fish-curing and meat-packing industries, in the preparation of leather, and for various other purposes.

Crude salt is produced by the mining and milling methods in the article under discussion; and also, and to a much larger extent in the United States, by evaporative methods from natural or artificial brine. In other countries the greater proportion comes from the mines, which, in many instances, possess beds of enormous thickness. One deposit near Berlin has been proved to persist to a depth of 4000 ft. from near the surface. Evaporative systems include the solar method, which can be worked only for part of the year in a temperate climate; steam evaporation in kettles and in what are known as grainers; evaporation in open vessels by means of heat; and vacuum-pan evaporation. All these methods are at present in use. In the dressing of the crude material to produce fine salt the crystals are washed, dried in rotary driers, and crushed between rolls. Multiple screens separate into various grades and return any oversize for further reduction.

The mining of salt has necessitated the overcoming of many special problems, particularly when water has been encountered during shaft-sinking operations, and when it has been necessary to keep the lower levels of the mine dry. Augur drills, operated by compressed air, are used extensively; and single blasts may bring down 500 tons or more of salt.

The New Draft

THE new draft law and the recently announced determination of the Administration to place an army of 5,000,000 men in the field are good news. We like the plan, even though we may have to make our sacrifices. There is nothing saved in half-way measures. We are fighting a cruel and blood-thirsty enemy, who has thrown his all into the ring. No better news for us can filter into Germany than the knowledge that we have placed our full man power, as well as our resources, in the fight.

We waste time in speculating as to when the war will be over. It will end when it ends, and it will end soonest when we have marshaled our full strength in the field. We will win the war, but it is not wise to prolong it indefinitely. Others fiddled with the Panama Canal. We built it; but we had to learn the lesson of concentrating our resources and our finances in sufficient quantity. The war is only another Panama, but a bigger one. The digging is there, but of a different kind. The engineering skill, the inventive genius, the powers of organization, the resources that accomplished the first great task, will build our ships, place our men and guns "over there," and win the war. The Administration now realizes this. Let us do our share.

Every Employer Can Help the Nation and Himself Under This Plan

ON PAGES 46 and 47 of this issue we publish the announcement of a plan in which, under an organized method, the coöperation of every employer is requested in order to help in the promotion of the Fourth Liberty Loan. That announcement is worthy of your careful and immediate attention and action.

It is certainly not difficult to see how the energetic carrying out of this plan may produce results helpful not only to the Liberty Loan but to American business. The tremendous impetus which Charles M. Schwab has given to shipbuilding has been largely achieved by making every individual engaged in the industry feel a personal responsibility for results and a personal pride in helping to make great results possible.

This spirit of accomplishment in the shipbuilding industry has been brought about by the leaders, the employers, the bosses—whatever you choose to call them—making it a business to come in personal contact with the workers and to inspire and enthuse the men with a sense of the importance of their work for victory in the war—with a sense of personal responsibility and a spirit of team-work.

The creation of that spirit among the workers of the nation in all lines of activity would be of incalculable benefit to the workers themselves, to employers, and to the nation.

Concretely stated, two of these results would be:

1. To quicken and increase the response to all war measures such as Liberty Loans—War Savings Stamps—the draft—food and fuel saving.

2. It would make the worker feel more keenly his responsibility to do his work (no matter what its character) to the very best of his ability. Make him feel the necessity of sticking closely to his job.

Employers generally should pursue with intelligent enthusiasm the plan of "Win-the-War" meetings proposed as a means to aiding the rapid flotation of the Fourth Liberty Loan. The results of such action will not only be helpful in the Loan drive, they will be permanently helpful to the nation through the development of a keener realization by the worker of the importance and dignity of his individual job and the necessity for personal responsibility and helpful team-work.

Every employer, every mining company, and every reduction company can be a leader and a center of influence in this work.

The man who operates a small business with relatively few employees may feel that his circle of influence is too small to be worthy of any effort. That is a mistake. It is the aggregate that counts, as the announcement of the plan very clearly points out.

The man who is in a relatively small circle may not hold so pretentious a meeting—it may not be formal or run under parliamentary rules—it may not be especially announced, or accompanied by music and oratory. But the man who will quietly call a dozen employees around him and informally, thoughtfully, lead discussion into win-the-war channels, pointing out the importance of the individual's doing his best in support of Liberty loans and all other war activities, can do a real service in this way. It can be so well done in no other way. And ten thousand such little meetings would produce an enormous aggregate result.

Whether his opportunity be great or small, every American business man should carry out this idea in a definite, systematic manner. The "Program" pamphlet which is mentioned in the announcement will be found tremendously helpful in its suggestions as to what should be done under any circumstances.

The War-Minerals Bill

SENATOR HENDERSON has introduced a bill, which has already been approved by the Senate Committee on Mines and Mining, as a substitute for the bill passed by the House. The latter was a clumsy, ramshackle and dangerous adaptation of the Lever bill. Senator Henderson cast it aside and drafted an entirely new one, which is infinitely a better one.

Senator Henderson limits his bill to relatively few minerals and metals. Antimony, chrome ore, fluorspar, graphite, manganese, platinum, pyrites, sulphur, tungsten and tin are the most important. The bill authorizes the President to enter into contracts for buying or selling these substances and provides a fund of $50,000,000 for the purpose. The President may designate any agency of the Government—the War Industries Board, the Department of the Interior, or any other, as he may see fit—to do this. Moreover, he is authorized to create a corporation, or corporations, to do it. The latter would manifestly be the logical thing to do, for a corporation can act with an efficiency that a Government bureau can not, as Mr. Ryan recently pointed out with so much lucidity.

Senator Henderson's bill is free from the irritating licensing provisions and the mischievous price-fixing authorizations that made the House bill so dangerous. The only things in it that we criticize are the retention of the unjust 75% payment-with-right-to-sue provision in the event that the owner of property taken over by the Government be dissatisfied with "just compensation, determined by the President." This might easily be made a form of legalized robbery. Another objectionable feature is the provision that the President, upon finding "that importation into the United States of any of the necessaries . . . is likely to result in a loss to the United States upon any necessaries which it may have acquired," may impose such an import duty as will be sufficient to protect the United States from loss. This means that the country as a whole would have to pay for errors of judgment by the Administration, which, of course, it would have to do anyhow, but under the method of recouping by import duty the people would probably have to pay many times over. It would be cheaper and more economic for the Government to pocket its loss in the first place.

The lapse of time since this war-minerals proposition was first broached, and the natural easing of tension in the meanwhile, tend to confirm our original opinion that this legislation is unnecessary; but, inasmuch as departments of the Administration have set their heart upon it, Congress is obviously bound to defer to their wishes. Senator Henderson's bill complies with those wishes and does it in a sound, businesslike way.

Remember the Comfort Fund of the 27th Engineers.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittance are made in even dollars, we will return the excess over an order in coupons if so requested.

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(See also "Petroleum and Natural Gas")

9827—COKE—Methods for More Efficiently Utilizing Our Fuel Resources. Part XIX. By-Product Coke Ovens. E. B. Elliott. (Gen. Elec. Rev., July, 1918; 13½ pp., illus.) 20c.

9828—COKE—Some Characteristics of American Coals in By-Product Coking Practice. F. W. Sperr, Jr. (Journ. Frank Inst., Aug., 1918; 32 pp., illus.) 40c.

9829—COKE BYPRODUCTS—The Wastage of Coke Byproducts. Frederick MacCoy. (Eng. and Min. Journ., Aug. 10, 1918; 1½ pp., illus.) 20c.

9830—PEAT—L'Industrie de la Tourbe. L. Fabre. (Rev. de Chim. Ind., Apr., 1918; 3¾ pp.)

9831—PRODUCER GAS, Its Manufacture and Use. C. S. Palmer. (Proc., Engrs. Soc. W. Penn., May, 1918; 33 pp., illus.) 40c.

9832—STORED COAL—The Diffusion of Oxygen Through Stored Coal. S. H. Katz. (Tech. paper 170, U. S. Bureau of Mines, 1917; 48 pp., illus.)

MINING AND METALLURGICAL MACHINERY

9833—DRILL—Choosing the Right Rock Drill. John F. Berteling. (Mine and Quarry, July, 1918; 6 pp., illus.) 20c.

9834—WELDING—Oxy-Acetylene Welding of a Roll-Frame. O. J. Zook. (Min. and Sci. Press, Aug. 3, 1918; 1½ pp., illus.) 20c.

INDUSTRIAL CHEMISTRY

9835—GERMANY—L'Industrie Allemande et la Guerre. R. C. Jaureguy, H. B. Froment and R. E. Stephen. (Bull. Soc. d'Encour., May-June, 1918; 69 pp.) Discusses nitrogen, sulphur and sulphuric acid, fuels, iron and other metals.

9836—PACIFIC COAST—The Future of Electrochemistry and Metallurgy on the Pacific Coast. J. W. Beckman. (Chem. and Met. Eng., July 1, 1918; 1¼ pp.) Extracts from a paper before the Am. Inst. of Elec. Engrs.

9837—SOUTHERN CALIFORNIA—Prospects of a Chemical Industry in Southern California. Julius Koebig. (Chem. and Met. Eng., July 1, 1918; 3½ pp.) Paper before Los Angeles Section, Am. Chem. Soc., dealing with possibilities of the development of the deposits of lignite and desert alkali into sources for the production of the fundamental chemicals.

9838—SULPHURIC ACID—Dearsenication of Sulphuric Acid. H. E. J. Cory. (Chem. Tr. Journ., Feb. 2, 1918; 1½ pp.) 40c.

9839—SULPHURIC ACID—Sulphur, Pyrites and Sulphuric Acid in 1917. Philip S. Smith. (Mineral Resources of the U. S., 1917—Part II; 44 pp.)

MISCELLANEOUS

9842—POWER—New Hydro-Electric Development on Dead River, Michigan. Morgan H. Wright. (Eng. and Min. Journ., Aug. 17, 1918; 1¾ pp., illus.) 20c.

9843—PRICE-FIXING. Editorial. (Eng. and Min. Journ., Aug. 3, 1918; 1¼ pp.) 20c.

9844—WAR—First Report of the Work of the Munition Resources Commission. (Canada Munition Resources Commission, Nov., 1915, to Feb., 1918; 27 pp.)

9845—WAR—Food for the War. H. C. Hoover. (Min. and Sci. Press, May 18, 1918; 5½ pp.) 20c.

9846—WAR—French Quarries Inspected by U. S. Engineers. Robert K. Tomlin, Jr. (Eng. and Min. Journ., Apr. 6, 1918; 2 pp., illus.) 20c.

9847—WAR—L'Industrie Allemande et la Guerre. R. C. Jaureguy, H. B. Froment and R. E. Stephen. (Bull. Soc. d'Encour., May-June, 1918; 69 pp.) Discusses Germany's supply of nitrogen, sulphur and sulphuric acid, fuels, iron and other metals.

9848—WAR—Mining in "No Man's Land." H. D. Trounce. (Eng. and Min. Journ., July 27, 1918; 1¼ pp.) 20c. A reprint from "The Castle," published at Camp A. A. Humphreys, Va.

9849—WAR—Price-Bidding in War Times. Roswell C. McCrea. (Chem. and Met. Eng., July 15, 1918; 6 pp.) A discussion of the economic principles involved in public control of industry versus unrestricted competition; effect of price-bidding on labor and production; experience of Great Britain.

9850—WAR—"Profiteering." Editorial Commenting on the Federal Trade Commission Report to the U. S. Senate. (Eng. and Min. Journ., July 6, 1918; 1¼ pp.) 20c.

9851—WAR— Road Builders Work Close to the Front in American Sector in France. Robert K. Tomlin, Jr. (Eng. and Min. Journ., May 25, 1918; 3¼ pp., illus.) 20c.

Personal

Have You Contributed to the Association of the 27th Engineers?

A. P. Watt has gone to Newfoundland on mine-examination work for a couple of weeks.

Fred Flint, of Salt Lake City, has been examining properties in western Nevada recently.

L. S. Cates, of Ray, Ariz., general manager of the Ray Consolidated Copper Co., was in Los Angeles, Calif., recently.

Charles Henrotin, of Haileybury, Ont., is operating a fluorspar property near Madoc, Ont., and shipping to the United States.

E. Jones, chief chemist of the Oliver Iron Mining Co. at Ely, Minn., is at Crosby, Minn., where he expects to open a laboratory of his own.

Sir John W. Carson, president of the Crown Reserve Mining Co., Ltd., inspected the Alice property recently at Idaho Springs, Colorado.

C. H. Claypool has been made superintendent for the Todd Stambaugh interests, with headquarters at Hibbing, Minn., to succeed **Bruce Middlemiss.**

H. W. Aldrich arrived at Miami, Ariz., on Aug. 21, where he will be assistant general superintendent for the Inspiration Consolidated Copper Company.

A. F. Keene has given up his London practice until peace is declared. In the meantime, his temporary address is Room 1100, 42 Broadway, New York.

G. E. Pidgeon, who has been in charge of the Rival Mining Co., at Twin Peaks, N. M., resigned on Sept. 1. He will go to California to enter service with the artillery.

E. J. Wilson, of New York, has resigned as consulting engineer for the Jacobs asbestos mines, in Quebec, and will be identified with the Johnson operations in the same district.

H. V. Snell, of Globe, Ariz., has been inspecting the Ash Peak Extension mine at Duncan, Ariz., and the Atwood mine at Lordsburg, N. M., in both of which he is interested.

J. S. Stewart, exploration engineer for the Midvale Steel Co., is at present making his headquarters at Grand Rapids, Minn., where he is supervising the drilling of some newly leased property.

A. M. Yonge has been appointed general manager of the West End Furnace at Roanoke, Va. Mr. Yonge also holds the position of efficiency engineer of the American Manganese Manufacturing Company.

Herbert C. Hoover has received the Audiffret prize of $3000 awarded by the French Academy of Moral and Political Science in recognition of his services as Food Administrator in Belgium and the occupied portion of France.

R. H. Banister, vice president of the Woodward Iron Co., has been granted a year's leave of absence after 25 years' service. **Frank Crockard**, formerly president of the Nova Scotia Steel Co., has been invited to join the Woodward company. **J. J. Shannon**, general manager of the latter company, has resigned.

Todd C. Woodworth, who operated in Chihuahua and Sonora, Mexico, for several years, has enlisted in the 42nd Canadian Highlanders (Black Watch) and is now over seas. His youngest son, also in the Canadian contingent, was killed in France a few months ago.

F. N. Flynn, general superintendent of the smelting and refining departments of the Consolidated Mining and Smelting Co. of Canada, Ltd., at Trail, B. C., has resigned. Mail addressed care of the American Institute of Mining Engineers, New York, will be forwarded.

Major John C. Greenway, of Warren, Ariz., general manager of the Calumet & Arizona Mining Co., who has been with the American engineers in France since last summer, has been given the rank of lieutenant colonel and, at his own request, transferred to the infantry.

T. A. Stiles, who has been in charge of the construction of the United Verde Extension smeltery in the Verde Valley, near Jerome, Ariz., was presented by his associates with a ring and watch, prior to his departure after completing the work. In a month he expects to leave New York for Oroya, Peru, to erect a large reduction plant on an Amazon tributary, east of Lima.

Capt. John E. Orr, mining engineer with the Mt. Morgan Gold Mines, of Mt. Morgan, Queensland, Australia, passed through Montreal recently on his way home after serving nearly three years in Gallipoli and France. He enlisted in 1914, won his commission on the field at Gallipoli, was wounded in France and has received his discharge. He will resume his work with the Mt. Morgan company.

N. H. Emmons, 2nd, joined the staff of the Air Nitrates Corporation, 360 Madison Ave., New York, in January, 1918, as engineer of materials and production. In July, he was given the position of operation director of the plant at Muscle Shoals, Ala. It will be remembered that the sulphuric acid plant of the Tennessee Copper Co. at Copperhill, Tenn., was put into successful operation under the management of Mr. Emmons in 1909, 1910 and 1911. The third unit was also started in 1916 under the same management.

John D. Ryan resigned on Sept. 3 as president and director of the Anaconda Copper Mining Co. for the period of the war, on account of the necessity of devoting all of his time to the service of the Government as Director of Air Service. **C. F. Kelley**, vice president, was chosen to succeed him. Mr. Ryan is also president of the United Metals Selling Co. and the Montana Power Co. and is vice president of the Greene Cananea Copper Co. He is a director of the Mechanics and Metals National Bank of New York, of the St. Paul R. R., the American International Corporation and of the Inspiration Consolidated Copper Co. He is a trustee of the American Surety Co. and is also a director of the Emigrant Industrial Savings Bank of New York.

Obituary

Joseph Hartshorne, a consulting metallurgical engineer, died at Pottstown, Penn., on Aug. 24, aged 70 years. He was in the class of 1873 at the Massachusetts Institute of Technology.

Terrance Curran, Dominion Government mining recorder in Yukon Territory, was drowned recently, his body having been found on Aug. 15 near White Horse, Y. T. He was 45 years old.

Norman Schultz, formerly one of the owners of the Jumbo and Bonanza mines, which were sold to the Kennecott Copper Corporation, died on Aug. 21, aged 65 years. His home was in Summit, New Jersey.

Prof. Samuel W. Williston, dean of palaeontology of the University of Chicago, died in Chicago on Aug. 30, aged 66 years. Shortly before his illness he was in charge of a corps of scientists in Texas engaged in exploring the fossil fields of that state.

Joseph Storey Curtis, an American engineer who went to South Africa in 1887, died at Johannesburg during the first week in July, from a sudden attack of pneumonia. Mr. Curtis first visited the Rand on behalf of the Rothschilds. His first work of importance there was to lay out the Langlaagte Estate. He later engaged in opening up the New Rietfontein property for the Rhodes-Rudd-Caldecott interests and subsequently the Village Main Reef, which was the first deep-level mine on the Rand. Mr. Curtis was one of the ablest geologists on the Rand and an authority on borehole deflections. He took an active interest in Rand politics. At the time of his death he was engaged in preparing a history of the Witwatersrand, which he left unfinished.

Societies

Mining and Metallurgical Society of America. The New York section held its monthly meeting on Sept. 5 at the Columbia University Club, 4 West 43rd St., New York. The guest of honor, C. W. Purington, addressed those present on the "War Activities of the American Committee of Engineers in London."

Association of Iron and Steel Electrical Engineers will hold its twelfth annual convention at the Southern Hotel, Baltimore, Md., on Sept. 11 to 13. Papers to be read include the following: "Automatic Engine Stops," by Walter Greenwood, safety engineer of the Ohio Works, Carnegie Steel Co.; "Bridge-Motors for Overhead Traveling Cranes," by R. H. McLain; "Condensers and Condenser Engineering Practice," by D. D. Pendleton, of Wheeler Condenser and Engineering Co., Pittsburgh; "Standardization of Ratings of Large Rolling Mill Motors," by K. A. Pauly, General Electric Co., Schenectady, N. Y.; "Electrically Driven Mills," by J. T. Sturtevant; and "Remote Controlled Sub-Station," by W. T. Snyder, National Tube Co. Reports will also be made by the safety committee on "Rules for the Safe Operation of Electric Cranes"; by the educational committee on "Methods of Education for Electrical Employees of Iron and Steel Mills"; and by the standardization committee. The plant of the Bethlehem Steel Co. at Sparrows Point, Md., will be inspected on the afternoon of Sept. 13.

National Exposition of Chemical Industries. More than 350 companies will exhibit at the fourth exposition to be held in the Grand Central Palace, New York, during the week of Sept. 23-30. The commandeering of the building as a base hospital by the Government, as announced in the press, will not affect the plans already made for the exposition, as the space to be occupied will not be required for war purposes until later. An elaborate program has been arranged. On the opening day addresses will be made by C. H. Herty, chairman of the advisory committee; William H. Nichols, president of the American Chemical Society; F. J. Tone, president of the American Electrochemical Society; and W. G. Thompson, president of the American Institute of Chemical Engineers. Papers to be presented at the various meetings during the week include the following: "Chemical Engineering in Explosives," by A. Hough; "Development of Nitric Acid Manufacture," by E. J. Franke; "Recovery of Potash from Kelp," by C. A. Higgins; "Recovery of Potash from Iron Blast Furnaces and Cement Kilns by Electrical Precipitation," by Linn Bradley; "Potash from Desert Lakes and Alunite," by John W. Hornsey; "Potash from Searles Lake," by H. W. Morse; "Development of Magnesium Industry," by Leonard Waldo; "Ferrocerium Pyrophoric Alloys," by Alcan Hirsch; "Ferromanganese," by Theodore Swann; and "Ferroalloys of Si, W, U, V, Mo and Ti," by Joseph W. Richards. Other papers will bear on the subjects of ceramics and industrial organic chemistry. Many motion picture films will be shown relating to industries mentioned, as well as to the oil industries, to water-power development, and to safety work. Members of the advisory committee are Charles H. Herty, chairman; Raymond F. Bacon, L. H. Baekeland, Ellwood Hendrick, Henry B. Faber, Bernard C. Hesse, A. D. Little, William H. Nichols, R. P. Perry, H. C. Parmelee, G. W. Thompson, F. J. Tone, T. B. Wagner and M. C. Whitaker.

New Patents

United States patent specification listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Process of Annealing—Laurence H. Whitney, Pittsfield, Mass., assignor to General Electric Co. (U. S. No. 1,273,706; July 23, 1918.)

Steel—Liquid Metal-Charging Car for Open-Hearth Furnace—Charles W. McClure and Edgar J. Reilly, Youngstown, Ohio, assignors to the William Pollock Co., Youngstown, Ohio. (U. S. No. 1,273,391; July 23, 1918.)

Aluminum Alloy with Zn, Mg and Fe.—Truman S. Fuller, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,273,762; July 23, 1918.)

Aluminum Solder with Cu, Pb, Sn and Zn.—David M. Campbell, Brooklyn, N. Y. (U. S. No. 1,273,146; July 23, 1918.)

Drill Holder, Rock.—John M. Calderwood, Spanish Fork, Utah. (U. S. No. 1,273,733; July 23, 1918.)

Platinum Extraction From Sands, Process for.—Russell Thayer, Philadelphia, Penn. (U. S. No. 1,273,202; July 23, 1918.)

Concentrating Table—Earnest L. Standley, Rush, Ark. (U. S. No. 1,273,946; July 30, 1918.)

Electric Furnace Especially Adapted for Zinc—Hans Nathusius, Friedenshütte Kreis Beuthen, Germany. (U. S. No. 1,265,485; May 7, 1918.)

Electric Furnace—Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Company, Inc.; North Chicago, Ill. (U. S. No. 1,273,920; July 30, 1918.)

Ferrosilicid, Manufacture of Shaped Castings of—Napoleon G. Petinot, New York, N. Y., assignor to United States Alloys Corporation, New York, N. Y. (U. S. No. 1,274,360; July 30, 1918.)

Gold, Silver, Method of Cleaning—Charles Burrows Morey and Charles Joseph Huber, Buffalo, N. Y., assignors to Larkin Co., Buffalo, N. Y. (U. S. No. 1,274,186; July 30, 1918.)

Editorial Correspondence

SAN FRANCISCO—Aug. 28

Gold Dredging in California is to be reduced one-third by the voluntary surrender by the companies of one-third of the electric power they consume, according to an announcement made recently by Power Administrator H. G. Butler. About 47 gold dredges are operating in California, 22 of them operated by two companies, the Natomas Consolidated Co. and the Consolidated Goldfields Co. Operations are confined principally to the American and Feather rivers, where the power shortage is severe. This voluntary lessening of consumption, said Mr. Butler, does not insure against a greater curtailment in the future if essential war industries demand it.

Siskiyou County Chrome Mines have attracted recent attention of the U. S. Geological Survey. John S. Diller has completed a survey of the chrome regions in that county respecting the possible and probable production and the efforts being made to mine and ship the product. From this region he went to southwestern Oregon and from there will go into Del Norte County, Calif. Taking a broad view of the chrome possibilities in what may be generally termed the Klamath River region, it will be found that the chrome-bearing formations extend along both sides of the Klamath for its entire length across the northern part of Siskiyou County and into the northern part of Humboldt County and the southwestern corner of Del Norte County, a total distance of approximately 150 sectional miles. Its course is westerly and southerly through Siskiyou, southwest and northwest through Humboldt and northwest into Del Norte. The chrome-bearing area may be broadly stated as extending from the eastern side of Siskiyou to the Pacific Ocean and from the central portion of Humboldt County to the southern part of Josephine County, Ore., an area covering 120 miles east and west and 100 miles north and south. In Siskiyou County Chrome mining began in the vicinity of Dunsmuir, on a deposit now owned by the California Chrome Co. With the exception of this property, little chrome mining was done in the county until the present war created a demand for chromium and chrome ores. In the last three years the development has extended into all parts of the county where possibility of production was apparent, and today there is active development or production at numerous points, including Dunsmuir, Gazelle, Callahan, Fort Jones, Yreka, Gottville, Hamburg, Scott Bar and Seiad. It is probable that Siskiyou is now the largest chrome producer in the state. The recent action of the Department of Agriculture upon the initiative of the War Minerals Board in starting road work on the Klamath River will result in a large increase in the Klamath region production. The recent activity extends from Yreka northwest to Preston Peak, a distance of 100 miles. At Preston Peak camps 30 men are employed. In the vicinity of Shasta River and Happy Camp and on to Beaver Creek 15 or more deposits are under development. New camps are being established in the Scott River and Hamburg and Seiad districts. The Dolbear mines employ 80 men working in two shifts. Several motor trucks are employed to haul ore along the Klamath to Hornbrook and many more have been ordered. There are approximately 300 men employed along the Klamath and toward Preston Peak at mining and hauling. Altogether, Siskiyou County is producing a large share of the chrome required by Government work in the present war, as in the early days of California gold mining this county produced a large share of the gold that helped the Government in the Civil War.

DENVER—Aug. 26

The New Revenue Bill is holding the attention of Colorado mine operators, and is creating some anxiety on account of its recent modifications. Last week an apparent agreement was reached classifying business for exemption purposes as follows: Financial and transportation, 8%; manufacturing and farming, 10%; mining and other kindred hazardous business, 12%. It now appears that this classification has been dropped and a flat deduction of 10% on all business is to be adopted. It is believed that the classification should give mining a larger deduction because of the risks incident thereto. In this connection, the American Mining Congress has appealed to the committee for a personal interview with the chairman, in an attempt to correct the wrong that will be done the mines in failing to recognize the risks in the mining business. It is also urged that war profits be taken per unit, rather than on aggregate earnings, as this is the only accurate way of finding war profits in mining.

SALT LAKE CITY—Aug. 30.

Southern Utah Iron Deposits are receiving attention, and their exploitation is being considered. An immense amount of iron is being used in the progress of the war, and it is not likely that the demand will decrease with the declaration of peace. The Government shipyards on the Pacific Coast have brought an increasing demand for iron and its products further westward. There is no question of the value and extent of the Utah deposits. It has been a matter of finding a suitable market as well as of transportation. The plans for the development of Utah iron ore are said to include the building of large blast furnaces as well as the opening of coal mines in the neighborhood. Some of the owners are the Southern Utah Iron Co., the Milner Iron Co. and Walker Brothers.

Assurance That the Proposed New Railroad into the west Tintic section will be built during 1918 has been given to operators in this district. This will mean increased activity in a section which has been neglected for a long time, principally on account of heavy haulage costs. The present wagon-haul to the railroad costs about $10 per ton. Manganese ore has been opened in several places in west Tintic, but up to the present time has been little developed. The manganese showings can be traced for three miles, and in places float is found over a width of several hundred feet. There is promise that the west Tintic section may produce a considerable tonnage of manganese ore, which would be desirable at this time. Lead, silver, copper and zinc also occur here. Among the properties are the Tintic Delaware, Deseret Mountain, Scotia, O. K. Silver, Sharp, Six Mile, Utah Zinc, Imperial Lead, Utah Majestic, Copper Jack, Lucky Shepherd and Utonia.

PHOENIX, ARIZ.—Aug. 28

The University of Arizona has signed a contract with the War Department to continue training of soldiers until June 20, 1919. Special training is given in automobile and general mechanics, radio operation, electricity and surveying. The first class, consisting of 206, was graduated on Aug. 26.

The Complaint of Arizona Gold Miners is that their product remains the one thing of value that has not mounted in price during a three-year period in which copper, lead, silver and zinc have doubled in selling value and wherein labor, supplies, material and even transportation and taxes all have risen until the sum total absorbs the earnings of any gold property that is not in the bonanza class. In Arizona the wage cost is on the basis of the mining of copper and the sale of that metal at an officially fixed price designed to cover an advance of wages. Gold is mined at a tonnage cost far above that known in copper mining, and the required skilled miners are hard to secure during the sharp demand of the copper camps for bosses at high wages. Present conditions are also operating against the development of new gold mines, for prospectors or the average small development company cannot afford to sink when every foot of depth costs twice as much as it did a couple of years ago. J. A. Burgess, superintendent of the United Eastern company, has stated that he sees nothing ahead short of a bonus by the Government on gold production, based upon mint deliveries at the current value of $20.67 an ounce. He passes by as negligible suggestions that there be remission of all taxes and that the Government take over and work the gold mines. Even concerning his own suggestion, he writes, "Whether gold production can be stimulated indefinitely in this way without impairing our financial structure, would require a closer analysis in the light of economic and financial science that I am prepared to give."

JOPLIN, MO.—Sept. 2

Criticism of the Allocating Committee which has charge of the distribution of the high-grade zinc ores that bring $75 per ton in this district has been made to the War Industries Board by A. N. Stanfield, operator of the Monkey Hill mine, near Rush, Ark. He telegraphed a protest, in which he charged that the committee is showing special favors, and complained that his company is not recognized "though producing higher-grade ore than any produced in the Joplin field." The "Yellville Mining Reporter" gives publicity to his protest and predicts that some "interesting developments" may come out of it. Local producers are inclined to believe the protest entirely unfounded and ill considered, and believe the allocating committee is doing a hard job with general satisfaction.

Four Acres of Ground were lowered to the 220 level of the Oronogo Circle mine by the explosion of 16,700 lb. of dynamite on Aug. 21. Part of the old mill belonging to the company dropped into the cave after the explosion, and a crusher and hoist engine were also lost, but outside of this the big blast caused no unforeseen trouble. The powder was divided among 152 holes, the largest of which contained 77 boxes. A 110-volt current was used, and the dynamite was 40%. The lowering of the ground was a part of the daylight mining project undertaken by the Connecticut Zinc Co. about two years ago, when it was decided to strip the upper surface, shoot down the workings of the mine, and handle it altogether as a steam-shovel proposition. The new 2000-ton concentrator, the largest in the district, has been completed for months, and the company will now proceed with the actual mining operations. S. L. Wilkins is superintendent and A. S. Raymond is president of the company. It is expected that the dirt will show about 2% recovery, but working three eight-hour shifts a day the mill will be able to handle from 2500 to 3000 tons per day.

The Oronogo Mutual Mill and Lease, at Oronogo, Mo., has been bought by Charles T. Orr, of Webb City, who will operate. The mine, which is a sheet-ground property and a heavy producer, was owned by the Waring family, and was managed by Guy H. Waring. The Warings took over the property in August, 1914, after it had been idle about three years. As the Judge mine, it had never been a success, but under the stimulus of the good prices of 1915, Waring made of it a profitable property. He enlarged and improved the mill, and added to the lease until the mine now rivals the locally famous Circle, now operated by the Connecticut Zinc Co. C. T. Orr, the buyer, is the head of the Athletic Mining and Smelting Co., which has a zinc smeltery at Fort Smith, Ark. For several years he has been operating the Bertha A and Wingfield mines, at Webb City. The Wingfield mill was moved to the Oklahoma field eight months ago, where it is now in operation. Orr also is operating the Athletic mine, in the Duenweg camp. C. A. Rice, who has been superintendent at the Athletic for some years, will be superintendent at the Mutual, and Ray Munson, formerly with the Continental Zinc Co., will be superintendent at the Athletic. No other changes in the officers or crew at either property are contemplated.

HOUGHTON, MICH.—Aug. 27

Copper Mine Managers in this district express themselves freely as being unopposed to the taking over of the mines by the Government if it is done on a basis that is amicable to the employees of the mines and to the shareholders of the corporations. Mine managements have generally found it profitable and pleasant to consider their duty to their employees quite as much of a business necessity as their duty to the shareholders. The situation as regards the total output of copper undoubtedly could be improved if the Government took complete control and worked the richest parts of the richest mines with the limited number of

men now on duty in the mines. Such a solution may become necessary as a war measure, but it could not be brought about without an unfair deal to the shareholders of small properties, explorations and low-grade mines. There is a general belief that the continuation of the war for another six months may result in cessation of work at numerous local exploration properties that are not producing enough copper to make their operation worth while, and some of which are non-producers. As matters now stand there can be no expected increase in copper output during the war. On the other hand, there will be a decided falling off during the remainder of this year and for several months in 1919, as the new selective draft bill will take many men from this district. Even if miners are exempted from service from now until the end of the war, there can be no additions to forces. The Government regulation which insists that the interpretation of the work-or-fight order should be enforced is doing well enough here, but the ruling that is supposed to prevent employees from leaving their jobs and moving into other districts is absolutely without effect in the district. No new men are coming in, for the corporations are obeying the rules rigidly. The only hope for improvement in the situation is that relative to electric tramming, which has the handicap that electric manufacturing companies are unable to deliver locomotives on anything like reasonable schedule.

DULUTH, MINN.—Aug. 28

The Cuyuna Range was the only iron district in the Lake Superior region to show an increase of shipments in 1917 over those in 1916, and this year shipments will advance over those in 1917. More than 500,000 tons of manganiferous iron ore was shipped from the Cuyuna range last year. Before the war the greater part of this product used in the United States was imported. It is estimated that the Cuyuna will ship 2,800,000 tons of both iron and manganiferous ores this year.

SPOKANE—Aug. 26

The Gold Conference to be held in Spokane Sept. 5 and 6 under the direction of the Northwest Mining Association is causing a wide discussion. Frank A. Ross, one of the prominent mining authorities in this section, in attempting to head off radical action by the conference, gives out the following suggestions: "First, put into practical application the recognition of gold mining as a war industry, with special privileges as to taxation, priority in obtaining supplies, transportation and labor. Second, grant the immediate induction of labor, as has been done in the lumber industry. Third, build trunk-line motor-truck roads to inaccessible gold fields, precisely as the spruce forests have been made accessible by government-built railroads. Fourth, extend financial aid to such properties as may be judged by qualified Government specialists to be capable of producing metals essential to the conduct of the war. Fifth, grant a bounty on all new gold produced by the mines of the United States, the same to be paid by the Canadian government on new Canadian gold. This last suggestion concerns us most; it has divided public opinion, yet it is the most popular plan advanced. Any bounty must apply to new gold from both bona-fide gold miners and placers and also to the gold in other ores in which the gold is a byproduct. This arrangement is easily made. There is a vast difference between granting a bounty for the production of gold and decreeing an increase in the standard value of an ounce of gold. The former is a national affair and thoroughly practicable; the latter is an international problem and fraught with dangerous financial complications too vast for contemplation if used as an expedient. A bounty on gold is perfectly feasible as a war measure and certain to produce desired results. In my opinion, a bounty on gold would not cause the melting of old gold in the form of plate, jewelry and coin. In the first place, workmanship and successive profits give to gold plate and jewelry a market value considerably in excess of the value of the gold contained. A bounty would not be so high as to tempt owners of such articles to melt them down and take the chance of disposing of them contrary to such laws as could be quickly passed to cover the case if they do not already exist. There is little gold coin that would be obtainable for melting down in face of laws so drastic that few would run the risk for the sake of the bounty. The objection that bullion would come from foreign countries is groundless, for it does not enter a foreign country except in exchange for commodities and subject to the surveillance of the authorities or when specially ordered thereby. Certainly no bounty would be paid on smuggled bullion under the following plan: Let the bounty be granted on all new gold produced under these conditions: First, that gold, or doré, bullion, shall be bought only upon identification of the possessor and after explanation of the origin, purchase to be made at places to be designated by proper authorities, notably at the mint or refineries; second, in lieu of bullion, the applicant shall present certificates from the mint that bought his bullion, or from the public mill or smelter that bought his ores; third, that all such certificates from public mills or smelteries shall be officially endorsed by a Government inspector of ore shipments. Government inspection, of course, is a step toward Government regulation of public mills and smelteries, although offered solely as a war measure. I do not favor Government ownership or control of public mills and smelteries, but I am in favor of Government regulation. Only heavy shippers have been able to afford to have representatives present during the critical operations of weighing, crushing, sampling and assaying of their ores. By far the greater part of the popular distrust of public mills and smelteries, and of the bitter agitation against them, is due solely to the lack of a personal representative. It is inconceivable that mills and smelteries should offer objection to so reasonable an arrangement, in view of its justice and also of the direct benefit to themselves to be gained by a better business relation to the mining public."

VICTORIA, B. C.—Aug. 26

Consolidated Mining & Smelting Co. of Canada has announced an increase of 55c. per ton in treatment rates on all lead ores received at the Trail smeltery after Aug. 1. This increase has been made necessary by the increase in the price of coke and freight thereon, increase in wages at the smeltery and increased freight rates upon lead bullion shipped to Montreal. The circular letter containing notice of the advance is as follows: "Since Schedule B, lead ore rates, was published, we have been obliged to pay 40c. per ton more for coke to the collieries, which under that schedule amounts to an increase of 10c. per ton of ore. In addition to this, there may be an increase of freight on coke, but we are not certain yet of this, and there will be a further increase in price effective Aug. 1. We have been obliged to increase the wages at the smeltery by 30c. a shift, so that there is an increase of 45c. per ton under Schedule B on this account. Effective Aug. 1 we will, therefore, increase the base rate under Schedule B by 55c. per ton, plus 25% of the further increase in coke price and freight. Effective Aug. 12, rates on lead from Tadanac have been increased to $14.30 to Toronto and $16.50 per ton to Montreal. The increase in the freight rate from that which prevailed on Feb. 1 is, therefore, $2.30 per ton on shipments to Toronto and common points, and $4.50 per ton to Montreal and common points. Beginning with shipments received here in August, we shall be obliged to make an adjustment on account of this freight increase. As there is a considerable difference now between the Montreal and Toronto freight rates, and it is impossible to forecast the distribution owing to variations in munition demand, we therefore propose, as the simplest plan, to make this adjustment, commencing with ore received in August, by reducing the lead settlement price by the actual increase in the lead freight rates. We will advise you as soon as possible of the amount of the further increases in coke price and freight."

COBALT, ONT—Aug. 29

Delay in the Improvement of the wagon road from Elk Lake to Gowganda which was promised by the government in the spring has caused complaint on the part of the operators of the Gowganda silver district, and has deferred some projected exploration plans. Though there is only one producing mine in the district, there are a large number of explorations under way, all of which have been seriously hampered by the high cost of transportation. The lack of electric power for operations is another drawback. The Miller Lake-O'Brien has a limited power installation at the north outlet of Gowganda Lake, but this does not meet the demands of this mine alone, and it was closed recently by a break in the hydraulic machinery. The South Bay Mines Co. has made a partial installation of power at the south end of the lake, using the flow and falls of Hanging Stone Lake, but difficulties in financing have deferred completion of this installation, probably until next season. The initial power from the Hanging Stone project is only about 300 hp., which will be used by the nearby prospecting undertakings, but a proposed tunnel to divert the waters of a branch of the Montreal River will increase this several times. The labor situation in the district has improved somewhat by the influx from gold operations in northern Ontario, which have closed or been curtailed under the general policy of gold operators of the province. The principal explorations are proceeding in the vicinity of Miller Lake under the stimulus of the developments in the Miller Lake-O'Brien mine, owned by M. J. O'Brien, of Renfrew, Ontario. This mine shipped 20,000,000 oz. last year, and has a developed reserve of several million ounces. The ore was discovered at a depth of about 400 ft. in the diabase, continued up to the overlying Keewatin formation, where the silver ceased to be found in the vein, although the vein continued into the Keewatin. Most of the work by other companies is directed toward finding the extension of the Miller Lake-O'Brien vein or vein systems. So far no conclusive results have been secured on the adjoining property. The Crown Reserve Co., of Cobalt, has three claims on the Keewatin-diabase contact and is now sinking a shaft 100 ft., and drifting southeast along the vein course. The Castle property on the same contact and adjoining the Miller Lake-O'Brien property is under contract to the Trewthey Co., of Cobalt. The T. C. 177, known also as the "O'Brien Extension," is exploring claims in the Miller Lake section. The Reeve-Dobie, Crews-McFarlin and the Clevenger-Prophet companies are developing a diabase area west of the lake on the Mann Ridge. Nothing has been done on the Mann property, which now includes the Boyd-Gordon, since the negotiation with the Scottish syndicate ceased, in 1914. The property has been offered for sale for $400,000. The La Bric property, on which about $200,000 was spent, is idle. On Le Roy Lake, east of Gowganda, F. H. Collins, of New York, is carrying on surface explorations and sinking. The Canadian-Gowganda, also east of Gowganda, did some drilling last winter, but no work is being done this season. The Hudson Bay Co., of Cobalt, has suspended work in Leith Township, about four miles south of Hanging Stone Lake, after doing a large amount of exploration, with reported good results. The Silverado, in the same district, is operating on a small scale. Both of these properties are hampered by difficult transportation. The general prospects for the Gowganda district are considered good, and a number of engineers have been in the district this season in connection with new negotiations and new work.

QUEBEC—Aug. 28

The East Broughton Asbestos District is actively endeavoring to meet the special demands for "paper stock" and other fibre produced by the mines in this part of the Quebec asbestos district. The Quebec Asbestos Co. has restored its mill after the fire of last spring, and is treating about 350 tons daily. The introduction of steam-shovel mining in the open pit has greatly reduced costs and simplified operating. The material is now crushed in the pit and conveyed by belts to the drier. Improved milling has increased the percentage of "paper stock" grade. The adjoining Eastern Townships property has been acquired on a contract purchase by the Asbestos and Rubber Works, of New York, and is operating. The Fraser mine, owned by the Asbestos Corporation, has completed a mill and is operating. Some "crude" is produced from this property. Extensive mining development is under way. The Montreal property to the east of the Fraser is under option to a Boston syndicate, which purposes completing the mill and getting in operation in the spring. The Boston property in the east end of the belt is idle, owing to transport difficulties from the new pit opened by the company about one mile from the mill.

MEXICO CITY, MEX.—Aug. 20

The El Bordo Mines, in the Pachuca district, have been purchased by the Santa Gertandis Co., which will operate them. The Real del Monte y Pachuca Co. is operating all of its mills to full capacity. It is expected that the Pachuca district will mill over a million tons this year. A letter of recent date from a Mexican engineer says, "Outside of the central district, Pachuca, El Oro, Tlapujahua, Guanjuato, Zacatecas, Pozos Asientos, and Angangueo, and some districts of the north, like Catorce and surroundings and the mines situated near the Laredo line in Coahuila and Nuevo Leon, all the rest of the mining sections are in bad condition, and the outlook is uncertain. It is risky to venture trips on the Central railway north of Zacatecas, although there are some mines working in Durango. In Jalisco, the Amparo is working, but it is difficult to operate in the "Horte" district. With regard to mines in the south of Mexico, operations are impossible."

The Mining News

ALABAMA

Jefferson County

NATIONAL STEEL PRODUCTS (Bessemer)—Specifications are out for a 25-ton steel castings plant, including 150 x 40 ft. building, and general steel foundry equipment. W. J. Long is president.

SLOSS-SHEFFIELD STEEL & IRON (Birmingham)—Ground broken for coke and byproducts plant and for fabricated steel works, to cost about $9,000,000.

WOODWARD IRON (Woodward)—Working on estimates for a $25,000,000 steel mill to be financed by the Government.

ARIZONA

Cochise County

NORTH TIGRE (Douglas)—Has ordered a 50-ton concentrator.

Gila County

ARIZONA COMMERCIAL (Globe)—Sulphide body has been opened up on 1500 level.

Mohave County

EMERALD ISLE (Chloride)—Additional precipitation unit to be in operation early in September and will add 2000 lb. of cathodes to present daily copper production.

TUCKAHOE (Chloride)—Has installed hoist secured from Pictured Rock shaft at Oatman.

BANNER MINES (Kingman)—Compressor plant has been installed.

CACTUS QUEEN (Kingman)—Machinery has been purchased and when installed the main shaft will be sunk to 500 ft. and crosscutting begun. H. E. Barbee is directing manager.

CEDAR MINES (Kingman)—To be reopened, and will mine silver ore.

FRISCO MINES (Kingman)—Crosscutting toward vein on 300 level. Shaft to be sunk to 500 level.

GRANNIS (Kingman)—Shaft being sunk and has reached 50 ft. below tunnel level.

HACKBERRY (Kingman)—Main shaft has reached 800 level. Flotation plant is being installed.

RED CAP (Kingman)—Reopened and is showing good gold ore. Is being developed by tunnel and a crosscut is now being driven toward the hanging wall.

YUCCA TUNGSTEN (Yucca)—Operating new 60-ton mill, and producing carload of concentrates monthly. Output taken by the Government. Flotation is to be added. Harvey Klotsch is in charge.

Pima County

DAILY ARIZONA (Catalina)—Preparing to resume work and repairing roads for use of heavy traction engine.

GUNSIGHT (Gunsight)—Stoping silver-lead ore in vein at depth of 170 ft. Other old mines are operating in same district.

Santa Cruz County

TRENCH (Patagonia)—Compressor and drill equipment has been provided to sink shaft 200 ft.

Yuma County

RED CLOUD (Yuma)—Equipped with mill and new electric pumps. To sink shaft from present 500 level.

CALIFORNIA

Amador County

GWIN (Paloma) — Mining and milling machinery, including 100-stamp mill, steel hoist, compressors and six miles of cast iron pipe, and a sheet-iron building, have been sold and are to be converted to war uses. Mine has been idle for a number of years and reopening has been discouraged because of high cost of unwatering. Large tonnage of good ore known to be undeveloped. Has record of large gold production and was the first in the Mother Lode region to be equipped with steel hoist.

Eldorado County

INGRAHAM (Ashville)—Reopened after idleness of six months. Equipped with 10-stamp mill. Developed by 500-ft. tunnel and 250 ft. drift.

PELICAN CHROME (Folsom) — New unit being installed to increase concentrating capacity from 50 to 100 tons. Water pumped from American River. Noble Electric Steel Co. is owner.

Lassen County

GOLD-SILVER DEPOSITS in Mountain Meadow district being prospected and 35 claims recently recorded. One group of claims is east of Goodrich ranch; the other is west of Brown ranch. Well-defined vein outcrops, which are cut by a fault at right angles with the northwest and southeast course of the formation.

Modoc County

HESS (Alturas)—Old producer, in Hayden Hill district, made recent shipment of bullion.

Nevada County

LIBERTY HILL (Washington) — Dam and by-pass under construction. Cleaning out ditches and reservoirs.

Plumas County

LIME DEPOSITS at Virgilia, on the Western Pacific, to be developed with the purpose of obtaining lime for fertilizing orchard lands in Oroville region.

San Luis Obispo County

CHROME SHIPMENTS from J. F. Beckett deposit, in Los Osos Valley, begun Aug. 12 at rate of two carloads a week. Beckett has taken lease on manganese deposit five miles southeast of San Luis Obispo.

Sierra County

HYDRAULIC MINES at Brandy City and Howland Flat being prepared for winter work. Brandy City Co. installing new restraining barrier and modern equipment for handling gravel. Loftus-Blue Lead improving and reinforcing Slate Creek dam near Howland Flat, which also holds tailings from the mines at St. Louis. Company in position to handle 10,000 cu.yd. gravel per day. Several smaller placer mines also getting ready for winter work.

Tuolumne County

OAK HILL (Cooperstown)—Lumber and machinery arrived for new plant. Development encouraging.

DUTCH-SWEENEY-APP (Jamestown)—Timber received for construction of new mill. New steel headframe will be installed at the Dutch.

Yuba County

WALKER (Spencerville) — Machinery ready for new installation.

UTAH

Box Elder County

LAKE VIEW MINING (Saline)—Some zinc ore and zinc-lead ore being produced.

Juab County

TINTIC SHIPMENTS for the week ended Aug. 24 were 158 cars.

EMPIRE MINES (Eureka) — New ore opened in drift to east on 1800 level of Lower Mammoth part of extensive holdings. Property is the consolidation of a number of holdings. Knight interests are in control.

TINTIC STANDARD (Eureka)—Shipments hampered by trouble with motor trucks.

Piute County

MINERAL PRODUCTS (Marysvale) — Experimental work recently done with view of recovering sulphuric acid, driven off in roasting alunite. Reduction plant to produce metallic aluminum from residues being considered.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Work to be done in two winzes on Silver King fissure.

PERUVIAN (Alta)—A 4000 ft., 100-ton tramway to carry ore down below the snowslide line in Superior gulch is to be completed in about three months. Loading station to be on line of railroad of Little Cottonwood Transportation Co. J. P. Clays is manager.

SOUTH HECLA (Alta) — Four stopes opened in sulphide zone to east, and old carbonate stopes in west still producing. Prospecting and development being done.

MONTANA BINGHAM (Bingham) — Tunnel cut Mayflower vein of Fortuna on dip 1300 ft. below old Mayflower workings. Upper levels produced much good chalcocite ore in Mayflower ground.

AMERICAN CONSOLIDATED (Salt Lake—Property adjoining Cardiff in south fork of Big Cottonwood being developed by tunnel, and small stringers of ore are being followed.

Summit County

DALY WEST (Park City)—Crosscutting from 1200 level of Daly Judge to Daly West shaft. Crosscut expected to be complete early in September and stations will be cut in October.

SOUTH PARK (Park City)—Has acquired three mining claims in American Fork and Snake Creek districts from Alta-Park Company.

CANADA

British Columbia

CHROME DEPOSITS in the Rossland district are being prospected and investigated by private individuals and government agents. Several locations have been made. William Thomlinson advises prospectors in this district to have their ore also tested for platinum.

DELLIE MINING AND MILLING (Ainsworth)—Organized to take over property of Silver Hoard.

EDEN AND CRESCENT (Ainsworth)—Raise completed to surface.

MOUNTAIN CHIEF (Lower Arrow Lake)—Has begun shipping and expects to ship 500 tons per month.

UTICA (Slocan)—Charles F. Caldwell again in charge and ore shipments resumed.

Ontario

WALSH (Gowganda)—Station cut at 200 level. Drifting to cut vein on 100 level.

COBALT DISTRICT SHIPMENTS for the week ended Aug. 24 were: McKinley-Darragh, 60,000 lb.; Kerr Lake, 60,227; Buffalo, 85,453; Dominion Reduction, 88,000; O'Brien, 64,010; La Rose, 78,646; Aladdin Cobalt, 64,075 lb. Total 500,411 pounds.

BEAVER (Cobalt)—High-grade ore is being taken from vein recently encountered on 300 level. Orebody containing leaf silver has been found on 500 level.

PETERSON LAKE (Cobalt)—Flotation mill treating 60 tons of tailings per day from the former Seneca-Superior property.

PROVINCIAL (Cobalt)—To install 40-ton oil-flotation plant to treat low-grade ore. An electric pumping equipment also will be installed.

BURNSIDE (Kirkland Lake — New vein, thought to be an extension of No. 12 vein of the Tough Oakes, has been cut and shows good gold content.

ELLIOTT-KIRKLAND (Kirkland Lake)—Arrangements being made for diamond drilling.

MINAKER (Kirkland Lake)—Shaft down 75 ft., but has not cut vein, as was expected. Work has been hindered by want of water.

CHARETTE CLAIM (Boston Creek)—Surface work has uncovered promising veins. Mining machinery will be installed.

MEKKS SYNDICATE (Boston Creek)—Plans completed for exploration of this property near the Miller Independence.

WHITE RESERVE (Maple Mountain)—Operations suspended owing to labor shortage.

MEXICO

Sonora

LILY (Nacozari)—Has started extensive development work on large body of low-grade copper ore.

CANDELARIA (Nogales)—To be operated by a Mexican-American company, headed by Lazaro Puente.

NORTH TIGRE (Sonora)—Has ordered 50-ton concentrating mill.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
29	4.7550	101⅛	49½	2	4.7550	101⅛	49½
30	4.7550	101⅛	49½	3	4.7550	101⅛	49½
31	4.7550	101⅛	49½	4	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug. Sept.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
29	26	†	8.05	7.75	9 @9⅛ 8⅛
30	26	†	8.05	7.75	@9 8⅛
31	26	†	8.05	7.75	@9
2	...	....	....	....	....
3	26	†	8.05	7.75	8.75 @8.80
4	26	†	8.05	7.75	8.75 @8.80

*Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Aug. Sept.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
29	122	122	137	361½	361½	29½	28½	54
30	122	122	137	361½	361½	29½	28½	54
31	...	...	...	...	...	...	...	...
2	122	122	137	355½	355½	29½	28½	54
3	122	122	137	353½	353½	29½	28½	54
4	122	122	137	351½	351½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK, Sept. 4, 1918

The week has been essentially a holiday week, and the metal market has been characterized by little activity.

Copper—There is little of interest to report. The labor situation appears to be worrying every one, and it is expected that August mine production will be less than that of July.

Copper Sheets—The base price of copper sheets is 34½c. per lb. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—The market is inactive, with a weaker tendency. Singapore quoted £361½, c.i.f., London, on Aug. 29; £361½ on Aug. 30; (a) on Sept. 2; £353½ on Sept. 3; £351½ on Sept. 4.

(a) No quotation received.

Lead—The situation is still tight, and there is little to report.

Zinc—There is little to record beyond the fact that the market is extremely dull and that prices have measurably weakened since our last market report.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

The demand for rolled brass aggregates at present 4,685,000 lb. per day. The present production is 2,910,000 lb. per day. These facts were developed at a meeting in Washington last week between officials of the War Industries Board and representatives of the brass manufacturers. Shortage of unskilled laborers is at present causing a loss of production of 33⅓%, it was declared.

After an all-day discussion of the situation, the manufacturers agreed to stop the output of products going into non-essential uses. In the future each mill is to take its full quota of Government business. Every effort will be made on the part of manufacturers and on the part of officials to bring about conditions which will permit the speeding up of the rolled-brass mills of the country.

Other Metals

Aluminum—Unchanged.

Antimony—The market has been weaker this week. Although there is little business, the market is fundamently strong. At the close we quote spot 14@14¼c. We quote futures at 13¾., c.i.f., in bond, for September shipments.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50, @ $1.75 per pound.

Nickel—Market quotation: Ingot 40c.; shot 43c.; electrolytic 45c. per pound.

Quicksilver—Stocks are not large and inquiries are good. We quote $125@130. San Francisco reports by telegraph, $120; firm.

Silver and Platinum

Silver—Owing to the fact that the price of silver has been stabilized by our Government, and that the English authorities have conformed, there is nothing new to report. London, 49½d., New York, $1.01⅛ for 999 fine, with the British government buying at $1.01⅛ for one month, at designated points of delivery. London shipments to Aug. 31 total 697,000 ounces.

Mexican dollars at New York: Aug. 29, 78; Aug. 30, 78; Aug. 31, 78; Sept. 3, 78; Sept. 4, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 31—Blende, per ton, high, $77.60; Basis, 60% zinc, premium, $75; Class B, $65@60; Prime Western, $52.50; calamine, basis 40% zinc, $40@35. Average selling prices: blende, $54.36; calamine, $37.90; all zinc ores, $53.70.

Lead, high, $102.95; basis 80% lead, $100; average selling price, all grades of lead, $100.71 per ton.

Shipments the week: Blende, 10,973; calamine, 466; lead, 1491 tons. Value, all ores the week, $764,260.

Shipments eight months: Blende, 318,088; calamine, 13,923; lead, 50,567 tons. Value, all ores eight months, $21,325,030.

On Thursday sellers wanted $60 base; on Friday buyers offered $52.50 base Prime Western. There were few sellers until evening, but on Saturday morning many were ready to sell, and in the afternoon blende was being offered buyers, who had filled limited orders, at $50 basis.

Platteville, Wis., Aug. 31—Blende, basis 60% zinc, highest price reported, $73.50. Base price for premium grade, $75. Base price for high-lead blende, $50 to $52 per ton. Lead ore, basis 80% lead, $95 per ton. Shipments reported for the week were 2465 tons blende, 45 tons galena, and 710 tons sulphur ore. For the year to date the totals are 87,272 tons blende, 4944 tons galena and 33,143 tons sulphur ore. During the week 3114 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—The inability of the market to absorb the offerings that are coming in on a relatively large scale has produced greater dullness than last week. Ore of 40% grade is quoted nominally at $1.40 per unit. Ore of 50% grade is sold at a premium.

Manganese—Unchanged.

Molybdenum Ore—It is reported that greater quantities of ferromolybdenum are being used by the Government. As the supply of molybdenite comes from associations of mining companies, any free molybdenite is difficult to sell. The nominal quotation is $1, but there are no buyers in evidence.

Tungsten—A business in fine ores of several hundred tons was done in the last week. Most American producers are sold ahead and very little scheelite is offered. High-grade scheelite realizes $25.50 per unit. High-grade wolframite is quoted at $24.50 per unit. Lower grade ores are quoted at prices ranging from $20 to $25, according to the amount and kind of impurity

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 24c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

NEW YORK—Sept. 4

The meeting of iron and steel manufacturers in New York on Aug. 28, according to "Iron Age," was occupied solely with the labor question, and the matter of possible price changes for the last quarter of the year was not touched. Leaders in the industry realize that even the present insufficient rate of production cannot be maintained unless special measures are taken in connection with the new draft. More important still is the maintenance of existing hours and the safeguarding of the industry for the period of the war against such restrictions of output as have commonly accompanied union control. Some of the recent Washington decisions of labor issues have evidently not taken into account the grave consequences to the war program which would result from a wide enforcement of such findings in the steel and metal-working trades.

The conference on iron and steel prices between the general steel committee and the War Industries Board will take place on Sept. 18 at Washington. An all-day meeting of the committee in New York on Sept. 3 will be followed by others, at which the requests of various groups of manufacturers for higher prices will be considered.

The Lake Superior ore movement in August fell 934,000 tons below that of July, owing to the diversions of vessels from ore to grain. Yet with 9,725,000 tons moved

last month, against 10,659,000 tons in July, the total for the season up to Sept. 1 was the greatest on record—39,334,000 tons, against 39,215,000 tons to Sept. 1 in the previous high year, 1916. The fact that some pig-iron producers have not bought ore enough to carry them to next May, when 1919 ore comes down, indicates the beginning of calculations based on a marked change in the war situation.

PITTSBURGH—Sept. 3

Production of both pig iron and steel in August appears to have been at a slightly lower rate than in July, but in view of circumstances the output is regarded as fairly satisfactory. Strenuous efforts are now being made to increase production, the bottle neck having been shown clearly to be the supply of coal for coking, limiting the output of coke and in turn the output of pig iron and steel. The remarkable fact is shown that though since last May the weekly output of byproduct coke has increased fully 50,000 tons, the output of beehive coke has decreased nearly twice as much, and the Fuel and Railroad administrations are working hard to rectify the situation.

The increased estimates of steel requirements made by the War Industries Board, running not under 23,000,000 net tons of finished rolled steel for the half year, are due in part to increased direct war demands by reason of the offensive operations on the Western front, and in part to large railroad requirements, to put the railroads in condition for the winter. A large tonnage of rails is now being produced, shell-steel production at rail mills being reduced and overflowing into other steel-finishing departments. The Donora and Woodlawn wire mills are to be altered to roll shell rounds instead of rod billets. Ship steel now gives the mills no concern, as with proper distribution of plates to shipyards there is a sufficient supply, and many more hulls have been launched than it has been possible thus far to fit with engines, boilers and the numerous articles of equipment and furnishing required.

Few finishing departments of the steel trade are able, in making shipments, to get through with B-4 priorities, that being the grade accorded to jobbers, so that B-4 is not fully covered, in most cases, and priorities B-5 to B-8, inclusive, are left out, as well as the whole preference list, except as items on it are given priorities.

Pig Iron—Pig iron for purposes outside the preference list is absolutely unobtainable. Nearly all the pig iron is going to steel works, the tonnage of foundry iron required for war orders being relatively small. Even consumers working on orders carrying a high priority rating frequently have to secure allocations in order to get pig iron, but allocations are so restricted that they can generally be carried out promptly. An increased supply of coke is likely to result from the efforts of the Fuel and Railroad administrations, and it is probable also that several blast furnaces will be instructed to change from ferromanganese to pig iron, so that larger supplies of pig iron are in prospect, and they are badly needed, on account of the shortage in scrap supply. Reports of merchant furnaces having costs close to the set selling prices refer to particular cases, as many merchant furnaces have a comfortable spread. Set limits remain: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; gray forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less. W. P. Snyder & Co. report their computations of averages in August, based on actual sales, at $35.20 for bessemer and $32 for basic, as in former months.

Steel—There are practically no offerings of ordinary soft steel billets and sheet bars, and hardly any of shell-discard steel. Any surplus arising would doubtless be allocated before it could be offered in the market. Set limits remain: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—The ferromanganese market is only moderately active, consumers being well covered for this year. Too much ferromanganese is being made, rather than too little, and the authorities may instruct some furnaces to change from ferromanganese to pig iron. Prices remain at $250, delivered, for 70% ferromanganese, and at $75, furnace, for 16% spiegeleisen.

Coke—Byproduct coke output continues to increase from time to time as new ovens are completed. The last report, for the week ended Aug. 24, shows 546,058 net tons produced, this being 89.6% of the rated capacity of 609,634 tons, which is about as good a percentage as can be expected. Beehive coke output was 592,000 tons. Any furnace coke that can be spared from contract shipments is allocated, but as to Connellsville beehive, it is thought in some quarters too much is being offered for foundry use, on account of the higher price. Prices on Connellsville remain at $6 for furnace, $7 for foundry and $7.30 for crushed (over ¾-in). Prepared coke over ¾ in., from old dumps, has advanced from $6.50 to $6.75.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740		32.584	50.920	
Oct.	67.855	87.332		32.361	44.324	
Nov.	71.604	85.891		34.192	43.584	
Dec.	75.795	85.960		36.410	43.052	
Year	65.661	81.417		31.315	40.851	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073		117.500		135.250	
Oct.	23.500		110.000		125.000	
Nov.	23.500		110.000		125.000	
Dec.	23.500		110.000		125.000	
Year	27.180		124.892		138.401	

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542		244.038	
October	61.851		247.467	
November	74.740		274.943	
December	87.120		298.556	
Av. year	61.802		237.563	

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680		8.611		30.500	
October	6.710		6.650		30.500	
November	6.249		6.187		30.500	
December	6.375		6.312		30.500	
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360	8.670	8.190	8.635	54.000	54.000
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Sept. 3	
Alaska Gold M.	3⅛
Alaska Juneau	1⅛
Am.Sm.& Ref.,com.	78⅛
Am. Sm. & Ref., pf.	104⅛
Am. Sm. Sec., pf., A	90⅛
Am. Zinc	17
Am. Zinc, pf	51
Anaconda	68⅛
Batopilas Min	1⅛
Bethlehem Steel	86
Butte & Superior	26⅛
Butte Cop. & Zinc	11⅛
Cerro de Pasco	34⅛
Chile Cop.	16⅛
Chino	39⅛
Colo. Fuel & Iron	49⅛
Crucible Steel	69⅛
Crucible Steel, pf.	90
Dome Mines	9
Federal M. & S.	12
Federal M. & S., pf.	41
Great Nor., ore ctf.	33
Greene Cananea	45⅛
Gulf States Steel	84
Homestake	73
Inspiration Con.	54
InternationalNickel	29⅛
Kennecott	34⅛
Lackawanna Steel	86
Mexican Petrol	102
Miami Copper	28
Nat'l Lead, com.	58⅛
National Lead, pf.	102
Nev. Consol.	20⅞
Ontario Min	10
Ray Con	24⅛
Republic I.&S.,com.	94
Republic I. & S., pf.	102
Sloss-Sheffield	62⅛
Tennessee C. & C.	19
U. S. Steel, com.	115⅛
U. S. Steel, pf.	111
Utah Copper	84
Va. Iron C. & C.	72

BOSTON CURB* Sept. 3	
Alaska Mines Corp.	12
Boston Ely	.60
Boston & Mont.	.49
Butte & Lon'n Dev.	.15
Calaveras	.85
Chief Con.	3⅛
Contact	.15
Corbin	10
Cortez	.08
Crown Reserve	.15
Crystal Cop.	.51
Eagle & Blue Bell	2⅛
Houghton Copper	.75
Intermountain	‡.05
Iron Cap	19½
Mexican Metals	.41
Mines of America	1
Mojave Tungsten	.09
Nat. Zinc & Lead	.16
Nevada-Douglas	.43
New Baltic	.80
New Cornelia	17⅛
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	.90

SAN FRAN.* Sept. 3	
Alta	.03
Andes	.04
Best & Belcher	.02
Caledonia	.04
Challenge Con	.03
Confidence	.04
Con. Virginia	.24
Gould & Curry	‡.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.07
Mexican	.16
Occidental	.40
Ophir	.01
Overman	.01
Savage	.03
Sierra Nevada	.11
Union Con	.39
Utah Con	.01
Belmont	2.80
Jim Butler	.52
MacNamara	.31
Midway	.06
Mont.-Tonopah	.10
North Star	.05
Rescue Eula	.10
West End Con.	1.05
Atlanta	.03
Booth	.03
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.09
Kewanna	.01
Nevada Hills	.02
Nevada Packard	.26
Round Mountain	.18
Silver Pick	.04
White Caps	.16
Big Jim	‡.75
United Eastern	4.00

COLO. SPRINGS* Sept. 3	
Cresson Con.	4.68⅛
Doctor Jack Pot.	.03⅛
Elkton Con.	.04⅛
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.67
Granite	.19
Isabella	.04⅛
Mary McKinney	.07
Portland	.80
United Gold M.	.13
Vindicator	.38

BOSTON EXCH.* Sept. 3	
Adventure	‡.60
Ahmeek	‡75½
Algomah	‡.15
Alloues	50
Ariz. Com., ctfs.	16
Arnold	‡.20
Bingham Mines	10⅛
Bonanza	‡.16
Butte-Balaklava	.25
Calumet & Ariz.	.69
Calumet & Hecla	455
Centennial	‡12
Copper Range	47
Daly West	2⅛
Davis-Daly	5⅛
East Butte	‡10
Franklin	‡3⅛
Granby	81
Hancock	‡6
Hedley	‡12
Helvetia	‡.15
Indiana	‡.60
Isle Royale	‡27
Keweenaw	‡.87
Lake	5⅛
La Salle	‡2⅛
Mason Valley	‡3⅛
Mass	5
Mayflower	‡2⅛
Michigan	‡2⅛
Mohawk	‡56⅛
New Arcadian	1⅛
New Idria	‡13
North Butte	14⅛
North Lake	‡.60
Ojibway	‡.65
Old Dominion	‡39⅛
Osceola	54
Quincy	‡69⅛
St. Mary's M. L.	‡50
Santa Fe	‡.60
Seneca	12⅛
Shannon	‡3⅛
Shattuck-Ariz.	‡15⅛
So. Lake	‡1
So. Utah	‡.16
Superior	‡4⅛
Superior & Bost.	3⅛
Trinity	3⅛
Tuolumne	1
U. S. Smelting	43
U. S. Smelt'g, pf.	43
Utah Apex	1⅛
Utah Con.	10⅛
Utah Metal	2
Victoria	‡2
Winona	‡1⅛
Wolverine	24
Wyandot	‡.50

N. Y. CURB† Sept. 3	
Big Ledge	⅛
Butte & N. Y.	‡.75
Butte Detroit	.11
Caledonia	.43
Calumet & Jerome	⅛
Can. Cop. Corpn.	1⅛
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1⅛
Con. Coppermines	5⅛
Con. Nev.-Utah	‡
Emma Con.	‡.10
First Nat. Cop.	1⅛
Goldfield Con.	.21
Goldfield Merger	.02
Greenmonster	‡
Hecla Min.	4⅛
Howe Sound	‡4⅛
Jerome Verde	‡.50
Louisiana	‡
Magma	30
Majestic	.15
Marsh	.04
McKinley-Dar-Sa.	.45
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.41
Ohio Cop.	‡1
Rawley	‡2⅛
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.34
St. Joseph Lead	14⅛
Standard S. L.	1
Stewart	.13
Success	.11⅛
Tonopah	2
Tonopah Ex	1⅛
Tribullion	‡
Troy Arizona	.10
United Cop.	‡
United Verde Ext.	38
United Zinc	1⅛
Utica Mines	‡.08

TORONTO* Sept. 3	
Adanac	.05
Bailey	.02
Beaver Con.	.25
Chambers Ferland	.09
Coningas	2.37⅛
Hargraves	.03
Kerr Lake	5.62½
La Rose	.43½
Min. Corp. of Can.	‡2.00
Nipissing	8.62½
Peterson Lake	.07
Temiskaming	.28
Wettlaufer-Lor	.03
Davidson	.30
Dome Exten.	.13
Dome Lake	.10
Hollinger	4.75
McIntyre	1.37½
Newray	.11
Porcu. Crown	.10
Teck-Hughes	‡.14
Vipond	.10
West Dome	.08

* Bid prices. † Closing prices. ‡ Last Quotations.